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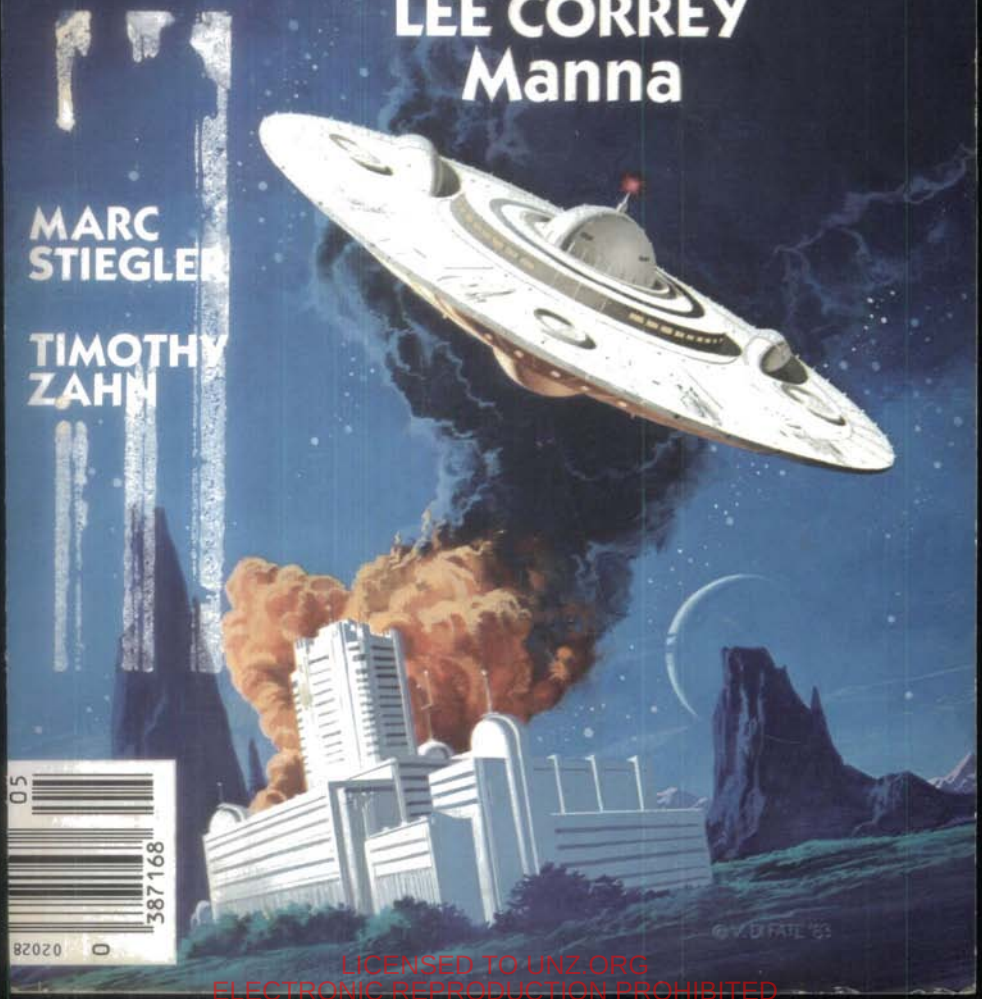

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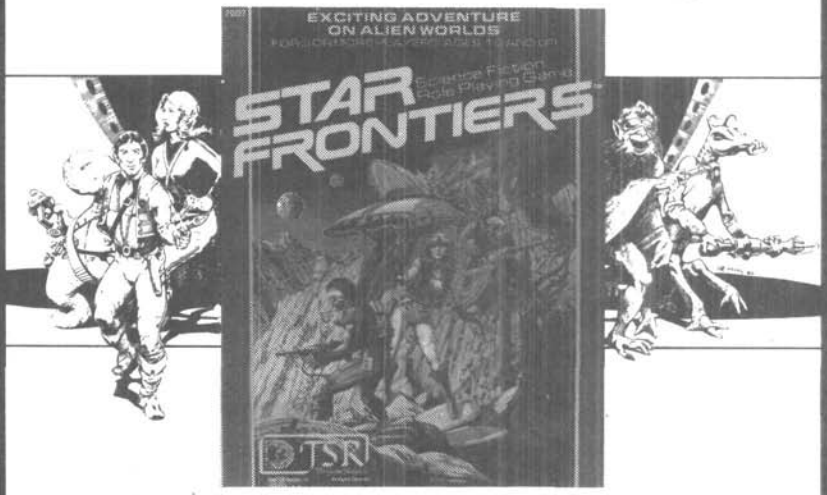

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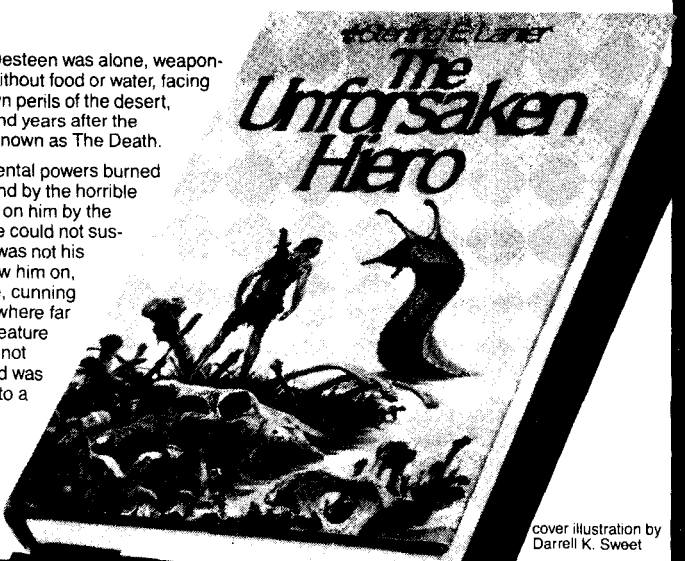

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Editorial

THE RIGHT TO WHAT?

Stanley Schmidt

It's quite possible for a human being to freeze to death in an extremely hot place. That sounds weird, but it's true if you define a hot place as one that has a high temperature. Temperature, you see, is defined quite rigorously as a measure of the average kinetic energy of the atoms or molecules in a region of space. But that is not the only factor that determines the rate of heat gain or loss from the body.

Suppose you go to a place where the temperature is, say, 10,000 K, but the ambient *pressure* is very low and there are no effective sources of radiant energy nearby. Such a place might be found, for example, on the shady side of a sturdy umbrella in space near a hot

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young blue giant star. A person finding himself there would be bombarded by very fast-moving particles, but so few of them that the total energy they added to his body would not begin to compensate for what he was losing by radiation. So he would freeze to death.

His parting impression of the place would be that it *felt* cold, not hot. The sensation of "hot" or "cold" is not so much a measure of ambient temperature as of the rate at which thermal energy is being gained or lost by the body. (More familiar examples are the "wind chill factor" and the extra-cold feel of metal objects on cold days.) This is really the quantity of more interest to the body. Our freezing spaceman would find little consolation, or clue as to how to save himself, in the knowledge that the near-vacuum around him had a temperature of 10,000 K.

I bring all this up only as a rather striking example of how we can get used to using a word to mean *A* when it really has a more complicated meaning *B* which happens to reduce to *A* in a particular context. When we enter a different context, we tend to forget the real meaning *B* and mistakenly assume that *A* is still the appropriate interpretation. We tend to equate "feels hot" with "has a high temperature" because those two qualities correlate pretty closely under most familiar conditions, such as still air in a well-insulated room of controlled humidity. If pressed, we'll admit that the correlation falters a bit when winds and humidity and thermal conductivity enter the picture, but the discrepancies are small enough that most of us (hypothermia victims excepted) tend to shrug them off. My freezing spaceperson example illustrates that the discrepancies *can* be much more than academic quibbles.

There are plenty of other examples, such as the common tendency to equate "pitch" with "frequency," even though pitch is really influenced, sometimes drastically, by several other factors. The one which is my main subject for the day has to do not with curiosities of physiological sensation, but rather with a controversy which has been very much in the public eye for several years. I'm speaking of the controversy over when, if ever, women should be allowed to have abortions.

I am not going to say that either of the extreme answers is The Right One; my opinion on that is of little importance to the world at large. What is important is that both sides should clearly understand what it is that they're debating, and in many cases they do not. Opposition to abortion is commonly identified with the phrase "Right to Life," while proponents of abortion question the existence, or at least the extent, of such a right.

Yet I can't offhand recall a single such discussion in which the right to *life* was actually the subject discussed, even though that was the word used.

There are people who genuinely believe in a right to life, at least for members of the animal kingdom. Such a belief is an important tenet of some eastern religions. But I've known very few "right-to-lifers" in this part of the world who consider it murder to squash a cockroach, and only a few more who had serious objections to trapping mice

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or catching a trout for breakfast while camping. Again, I'm not talking about my personal views; I have on occasion annoyed people by refusing to kill spiders, but that's neither here nor there. My sole intent here is to examine the logical consistency of opposing abortion on grounds of "right to life," and debating the issue in terms of when life begins. Since most people who do so see nothing particularly troublesome about killing many things which are clearly no less alive than any fetus, they do not really recognize a right to life. So I must conclude that when *life* begins is not the issue.

The issue, I think, is when *humanity* begins.

But what is that?

John W. Campbell tackled that one several years ago, in a lovely piece of thought provocation titled, "What Do You Mean—Human?" (recently reprinted in our *Readers' Choice* anthology). He came up with more questions than answers; among other things, he showed that various "obvious" and seemingly valid tests that might be proposed for "humanness" would rule out idiots, babies, or pirates with wooden legs, but admit robots or chimps. He did not come up with a test that gave *all* the "right" answers, according to our prevalent prejudices. Nor did he consider the application of his tests to *unborn* babies.

I don't know any biologist who would say that there is any question of whether fetuses or embryos are alive. (For convenience, I shall use the two terms interchangeably; the common distinction between them is really part of what's at issue here, anyway.) *Any* fetus (except a dead one), regardless of state of development, is quite clearly alive. (For that matter, by most definitions, so are isolated but viable ova and spermatozoa.) What people are really arguing about is, when does the fetus become *human?*

Let me propose for consideration at least a partial answer—if not to the large question of "What is human?", at least to the more immediate, operational one of, "When should a fetus be *treated* as human?" The key to my suggestion is an idea first proposed (somewhat crudely) by the nineteenth-century German biologist E. H. Haeckel: that "Ontogeny recapitulates phylogeny." The idea, simply put, is that the stages through which an individual organism develops correspond, at least approximately, to the stages of evolution which led to its species. Human embryos, for example, are well known to go through stages with tails and gills.

Later biologists, of course, recognized Haeckel's notion as a gross oversimplification. Recapitulation is not literal or exact; at no time does a human embryo closely resemble an *adult* fish, amphibian, or reptile. However, there are stages at which it is *very* similar to the *corresponding embryonic stage* of a fish, amphibian, or reptile. Only later does it diverge to become distinctively human.

So my proposal is this: at a stage when an embryo closely resembles that of another species, it deserves the same level of ethical consideration you would give to that species. At an amphibian-like stage, for example, you are justified in doing unto it as you would do unto

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a salamander. If one embryo is essentially indistinguishable from another, there seems to be no reason to treat them differently. If one is less than human and therefore deserving of less respect or protection, the other is equally so. If you believe it's all right to destroy salamanders, you may have to admit the same for human fetuses at the "salamander" stage of development. If you don't believe it's all right to destroy such fetuses, you may have to rethink your attitude toward salamanders.

If you reject the concept of evolution, this may seem instant grounds for rejecting my proposal, but in fact it does not depend on evolution, even though the idea originated there. Nobody accepts "Ontogeny recapitulates phylogeny" literally any more, anyway. My proposal does not depend on viewing a given embryonic stage as in any real sense mimicking an "evolutionary" stage, but only on recognizing its essential similarity to the corresponding stage of other, "lower" animals.

To certain types of "right-to-life" advocates, of course, even that will be violently unacceptable. Such a person might object that the human embryo is fundamentally different at *every* stage, by virtue of something he might call a *soul*. This may well be, but if it's going to be the basis of public policy we need reliable, provable methods to tell whether or not an entity has a soul. We also need answers to other questions, like, at what point does a fetus acquire one? I have never heard anyone claim that an egg or sperm cell had a soul, and at the instant of conception there is little more than the fusion of the two. Does a soul spring full-blown into being at that instant? Or is it genetically programmed to appear at some later point? Are souls quantized, in the sense that either you have one or you don't? Or do souls, like the rest of us, undergo progressive

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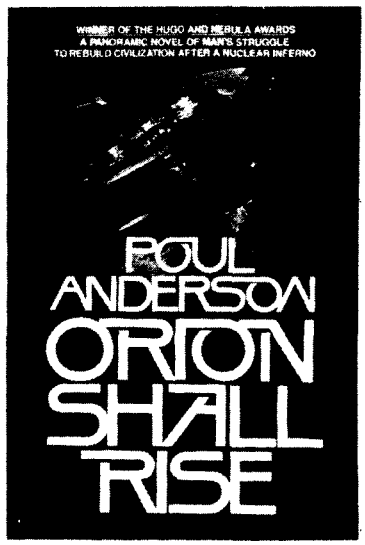

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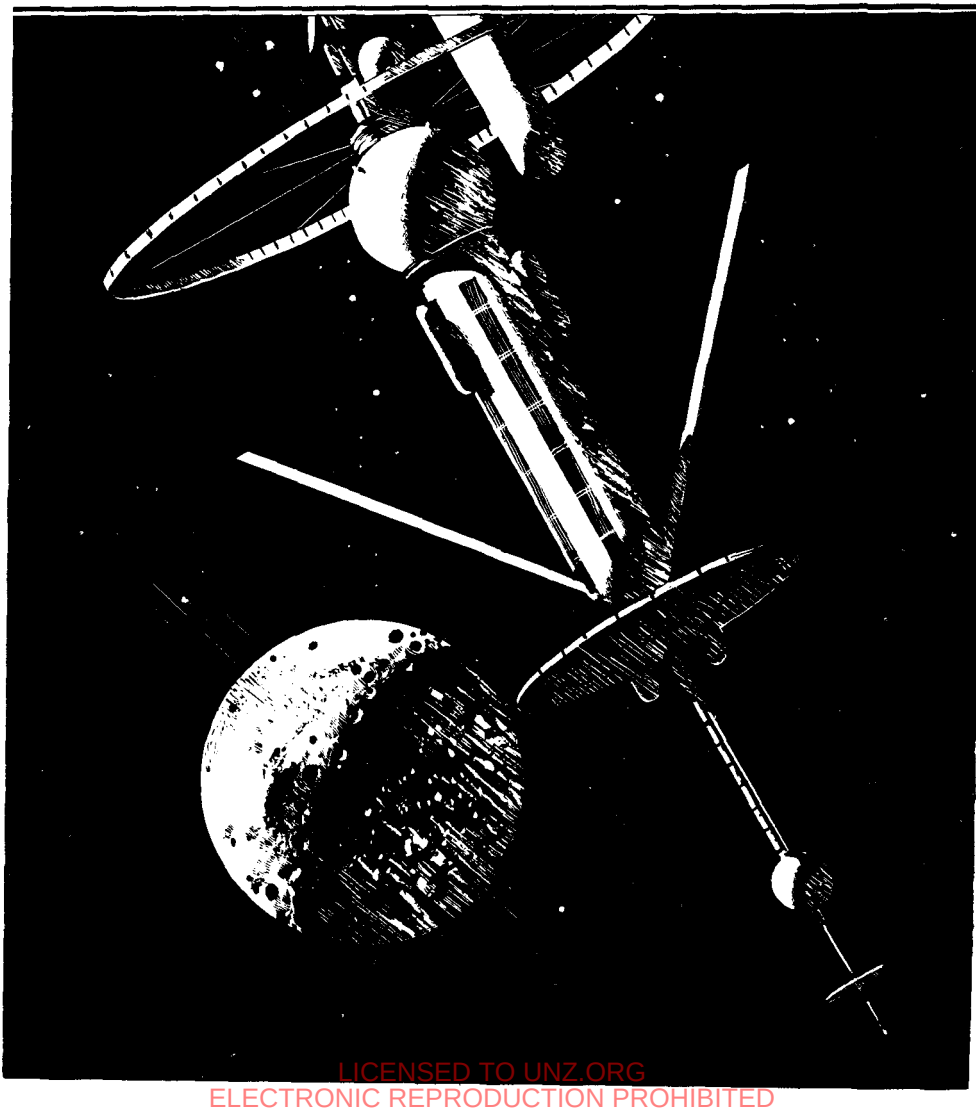
MANNA

Lee Correy

If technology radically alters one of the fundamental assumptions that have shaped human history, the first society to realize that fact may face trouble from those who haven't.

Part One of Three



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Soldiers were marching in the streets. Flags were flying. The schools were closed. Shops and offices were shut.

Everyone in the United Mitanni Commonwealth was taking a week off to celebrate the fiftieth anniversary of the Battle of Oidak on Christmas Day, 2000, and the forty-ninth anniversary of the founding of the Commonwealth on January 1, 2001.

Holiday or not, there I was, and there was no returning.

I walked down the almost empty esplanade of Topawa International Airport with my documents clutched in my hand, looking for customs officers or security police, who were common fixtures in every other international airport. But no one here seemed interested in my passport. Not wanting to be detained later as an illegal immigrant, I approached a Commonwealth Aerospace Lines employee. Unlike his counterparts in New York and Paris, he wore a twenty-five-centimeter dirk on his hip. "Excuse me," I asked deferentially, not wishing to offend an armed citizen in an unfamiliar land, "could you direct me to Passport Control and Customs, please?"

The man noted the bag I carried and replied, "This is a free country, sir. We don't use such things."

Well, if these people wanted to chance terrorists, revolutionaries, and criminals slipping in and out of their successful little country, that was their business.

Eric Hoffer once observed that the general state of a country's affairs could be determined by how well the plumbing worked. I found the rest room clean and the plumbing working.

I read again the hard copy of the classified ad from "Help Wanted, Aerospace" comm/info net bulletin board.

"PILOT, atmosphere and orbit ratings, recent professional military background. Immediate employment. Call collect 144-203-794-1171."

I'd made the call and discovered that Landlimo Corporation was headquartered in Topawa, the capital of the United Mitanni Commonwealth. A man named Wahak Teaq, who'd interviewed me, seemed interested but not sanguine. Personnel types usually are trained to appear that way. He was willing to foot the airlift tab to Topawa for an interview, and I agreed to come, but when I tried to learn about Landlimo Corporation, I struck out. It wasn't listed in Standard & Poor's International. But they were for real. The hard copy of Landlimo Corporation's letter of interest directed me to pick up my prepaid ticket at the nearest Commonwealth Aerospace Lines office and to call a specific telecomm number when I reached Topawa. The ticket had been waiting for me. But now, when I punched the number into my wrist phone, a phone robot answered with voice-only, "This is the office of Landlimo Corporation. Because of the Unification Holiday, we're closed until Monday, three January, twenty-fifty. Please call us then. The Vamori Free Space Port office is answering the emergency code. Thank you."

The letter didn't give an emergency number.

So what was I going to do for two days in a strange land where I didn't know anyone?

Answer: Find a hotel in Topawa, do some sightseeing, and wait.

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I'd rather be in Topawa, anyway. Under the circumstances that caused the U.S Aerospace Force to retire me, I didn't want to spend the holiday season at home locked in intellectual combat with my pacifistic, professorial father. He knew more history and always won our arguments; his commitment was to non-violence, my own to service in the military forces of my country. He couldn't understand my ulterior motive: going into space in the most advanced equipment available. The fact that I might have to fight didn't bother me.

My mother couldn't care less. If she couldn't manipulate it in a bio-engineering lab, it wasn't part of her world. She never understood the philosophical barriers between my father and me. She never understood me, either. *Never* pick a scientist for a mother!

I went looking for a bank or currency exchange booth and discovered there weren't any. When travelling on leave as a USAF officer, the first thing I did after clearing customs was to exchange whatever type of money I was carrying for the local currency minus an exchange fee for the bank. But the United Mitanni Commonwealth seemed to care as much about currency as they cared about passports. "We'll accept any money," the ticket seller for the railway into Topawa said, when I purchased my ducat at his window.

The signs directing me to the railway to downtown Topawa, some twenty kilometers west, led me to a covered platform. I was a few seconds too late. The train was already moving. The lighted board announced the next train in thirty minutes.

As I watched the train leave, I sensed something I hadn't known since my cadet days in the energy labs of the Academy: the smell of burning coal from the locomotive.

I had trouble believing anyone would *burn* coal. Why not alky-electric or even FotoFuel, I wondered? Then I remembered what I'd read about the huge bituminous coal fields in the Dilkon Range.

This was like stepping back a hundred years into the 20th century, without the problems 21st-century technology had solved in the meantime.

I didn't remain alone on the platform for long. Other people gathered to await the next train.

An attractive couple accompanied by a small, stocky barrel of a man with dark hair and a huge, bushy mustache waited about five meters from me. The young woman was armed with the usual short dirk hanging from a girdle resting lightly on her hips, and the mustached man wore a small curved scimitar. But the other young man bore no visible arms. Since everyone in this country seemed to go about armed with those short daggers, he must just have arrived via air. The couple looked related. Brother and sister perhaps. But Commonwealthers looked alike to me then, in spite of the fact that this country had been a melting pot for centuries.

I couldn't help overhearing their conversation, which was in English, the common language of this country—albeit spoken with a different accent, rhythm, and inflection and with vowel shifts that were quite unique.

"Ali, *why* did you do it that way?" the beautiful young woman was saying.

"What recourse did I have, Vaivan?"

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the young man answered doggedly. "I was facing power groups out to get us."

"They acted like barbarians moving in for the kill. *Nyeh Kuhltoornee!*" the mustached man growled.

"Omer, you're a good friend, but I'm glad you weren't in Santa Fe," said the woman. She radiated exotic beauty in the manner of women who know they have it, know what it's for, and are unabashedly unashamed of it.

I'd seen the unarmed man somewhere recently. The comm/info network produced so much information that most people were overcommunicated: they recalled only what directly concerned them. There wasn't time to absorb the details of the entire world system.

But a military officer must assimilate, evaluate, store, and recall a great deal of information rapidly and accurately. Some day, the fortunes of the service might demand some scrap of information without an opportunity to consult the comm/info library.

The mention of Santa Fe triggered my memory. I'd seen the young man on telenews. There was no mistaking his square face, piercing dark eyes, curly black hair, broad but determined mouth, and proud bearing. It had to be Alichin Vamori, the UMC delegate to the First International Space Commerce Convention, the Santa Fe conference.

In the Chaveney-Villepreux Airport during the plane change, I'd caught the thirty-second telenews scene showing Alichin Vamori walking out of that conference in protest. I hadn't heard why he'd done it.

I grew concerned. The Commonwealth's open borders were conducive to the easy movement of terrorists. These three had to be important people and, therefore, targets for assassins. Why were they standing openly on a railway platform waiting for public transportation? Other national leaders, corporate executives, and powerful people rarely exposed themselves in public without security cover, which wasn't evident here.

I was a stranger, and it wasn't my job to protect them. But if there were trouble I might find my anatomy uncovered. I began to glance around the platform at the others gathered there. My Aerospace Force training had included security precautions and visual personality profile evaluations. I'd never used them, and I didn't like hand-to-hand. But I scanned for telltale signs of potential trouble.

The wail of a three-tone steam whistle announced the arrival of the next train. It slipped into the station with a screaming whine as the locomotive swept past.

The noise and sight drew the attention of everyone on the platform—except two people.

My peripheral vision didn't see the details, only the motion involved in the sudden sweeping aside of a kaftan. My eyes shifted, and I recognized the distinctive black shape of a Zastava pocket autocarbine.

It took a fraction of a second for the gunman to slip the muzzle strap over his left hand so the light composite-plastic weapon could be fired with accuracy.

In that fraction of a second I had to act, because a Zastava has a cyclic rate of 1200 rounds per minute.

I covered the six meters between us in two strides and a leap. I caught the gunman waist-high with my left shoul-

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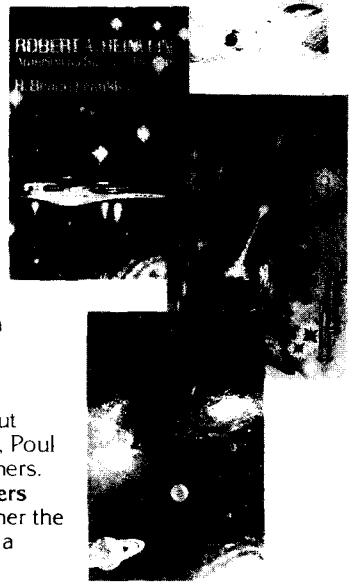

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der with the only body check I'd thrown since personal defense sessions in the Academy gym many years ago.

The assassin fired a clip of forty rounds. The noise of the Zastava sounded like a giant tearing a box. Everyone heard it, even over the noise of the halting train. But I'd hit him first, and the bullets went into the roof of the platform shed, where they exploded.

I hit the platform atop the gunman, whose body broke my fall. I rolled clear and was on my feet.

A scimitar slashed the fallen gunman's throat.

I discovered the tip of a short dirk at my throat, too.

I didn't move. The young woman accompanying Alichin Vamori was holding the hilt of that blade, and it didn't waver or tremble. Sexual assault in the Commonwealth had to be rare, if all women were as armed and willing to use their weapons as she appeared to be.

Looking directly into her dark eyes, I said slowly, "Is this the way you show gratitude for saving your life?"

"Are you sure that's what you were doing?" she said with equal coolness.

"Why else would I have gotten myself mussed?"

"Let the outlander be, Vaivan. I saw what happened." The mustached man wiped the blood from the scimitar with the gunman's kaftan. He replaced the weapon in the scabbard at his waist and reached down to pick up the now-useless pocket autocarbine. He looked it over and said with a Slavic accent, "Assassin's weapon, Zastava Vee-zee ninety-five. Zbrojovka manufacture, from the proof marks. Good only for one clip of forty, then throw it away. Not in Commonwealth service."

Alichin Vamori was kneeling over the dead body of the gunman. "There's an Ilkan ID tattoo on his arm, Vaivan."

The woman withdrew the tip of the weapon from my throat and returned the dagger to her waist. She offered both hands, palms up. I took them in mine because they were beautiful hands. "Sir, we're indebted to you. I'm Vaivan Vamoru Teaq, and this is my brother, Alichin Nogal Vamori." She indicated the young man who looked so much like her.

I grasped Vamori's hand. "I saw you on the telenews coverage of Santa Fe," I said to him.

"And you are . . .?"

"Alexander Sandhurst Baldwin, Captain, United States Aerospace Force, retired."

"I know of you," Vaivan Teaq said. "You're in the Commonwealth because of Landlimo Corporation?"

I nodded.

"I'm Landlimo's security manager. My apologies, Captain. This isn't the usual way we welcome visitors to the Commonwealth."

"I'm no longer a captain," I told her. "And I'm sorry we had to meet under these circumstances, Madame Teaq. . . ."

"Please," she said, "there are so many Teaqs and Vamoris that several of us would answer to 'Madame Teaq.' Since you'll be working with us, please call me Vaivan."

She could make any request of me any time she wanted to, but I simply said, "Only if you'll promise never to call me Alexander or Alex. My friends

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know me as Sandy. And I haven't been interviewed yet, much less accepted any job."

"You've just been interviewed." Alichin Vamori was looking down at the dead Ilkan gunman.

"If you can fly as well as you can fight, no problem," Vaivan added. "That is, if you want the job . . ."

"We'll talk," I said, "elsewhere than on a railway platform with a dead gunman at our feet."

"Such things don't bother us. Twenty-first-century civilized we may be, but we aren't many generations removed from somewhat violent ancestors."

The man with the mustache and scimitar was introduced as "Omer Kolil Astrabadi, the Mad Russian Space Jockey."

"Russian?" I asked. "Your name sounds Arabic."

Astrabadi grinned toothily. "I am not Russian. There was a time when my ancestors came westward over the steppes and ruled all the Russias. Now Russians rule us as as part of the Soviet empire . . . but that will not last forever. I am called Russian only because I was born in Tyuratam. I am Kazakh, or Cossack, by blood, but I have taken a Commonwealth name."

"Omer's one of the Soviet cosmonauts who defected to us," Alichin said.

"Ah, you act like a Russian. You confuse history to suit yourself. I defected to Gran Bahia and then came here . . ." said Astrabadi. "I will like flying with you, Sandy. It is good to fly without stupid politics in the way."

The police showed up to study, photograph, and remove the body of the gunman who was, according to his tattoo, a citizen of the Ilkan Empire located on the northern borders of the Commonwealth. The police asked questions of us and others on the platform. I produced my passport for ID, but they merely noted I wasn't a Commonwealth citizen. Statements were taken on recorders. They wrapped the body in a plastic sheet, finished their work, and went away. It seemed to be a closed case.

"There'll be an inquest to clear the record," Vaivan said.

"But Omer killed him."

"Before he killed us," she said. "There were many witnesses."

"A police investigation is nothing more than this?"

"What more do they need? And why should we waste time and money to investigate a hired gunman who's already dead?"

In the meantime, two trains had departed.

Commonwealth trains run on time with great regularity. I found myself accepting with pleasure Vaivan Teaq's invitation to board the next one with the trio.

Looking back on my first hours in the Commonwealth, I seem to recall them filled with fortuitous circumstances that were almost improbable. But remembered later, in the context of the Commonwealth culture I didn't understand then, these almost coincidental happenings were no more accidental or lucky than other occurrences which shape our lives.

Once aboard and in the comfortable compartment, Vaivan asked me, "What were your plans in Topawa, Sandy?"

"Your phone robot said the offices

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were closed until Monday. So I was going into Topawa to find a hotel and wait."

"That won't be necessary. You'll be staying at Karederu."

"Pardon?"

"The Vamori family compound," she explained. "We have an obligation to you. And I'll have two days to interview you and explain your job."

"You presume I've accepted," I said cautiously, inwardly excited that I'd have the opportunity to be her guest. I really wanted to see a lot more of Vaivan Vamoru Teaq.

"If you want to dicker, I'll turn you over to my dickering brother, Alichin."

"I'm sorry. It just seems you're being a bit presumptuous."

She sighed. "I keep forgetting about Americans. You could be offered the best job in the world, and you'd want to investigate and discuss all the perks and fringes."

"You seem to have us all figured out."

The Topawa-bound train was rolling swiftly past irrigated farmlands that came right up to the right-of-way, and the coach was rocking just slightly at speed. Alichin Vamori hunched over and put his elbows on his knees, folding his hands before him. "Sandy, I know your ways, but I keep forgetting you don't know ours. What do you know about our Commonwealth corporations?"

"I hear Commonwealth firms are somewhat paternalistic. Seems you learned a few things from the Japanese."

"Some. We don't own our companies outright, any more than President Nogal owns the Commonwealth's government corporation. We're part-owners along with everyone else who works for the companies. We believe in a participative meritocracy. I like my position as Ell-Five manager for ComSpat and Landlimo. It's to my advantage to do my work well. If I don't I'm hurting only myself, because I'm working for myself as well as for the company. This goes all the way up the line. Vaivan's husband, Wahak Teaq, will remain Landlimo's chief executive officer only as long as he does his job. Otherwise the stockholders will replace him."

That was why Vaivan had the Vamori family name and the additional "Teaq." I was devastated. Vaivan Vamoru Teaq was already married—to the man who'd be my boss if I joined them.

Alichin Vamori continued, "The world goes around only because people turn the crank on the industrial machine that makes it a place of plenty. Fifty years ago, we decided we'd do some cranking ourselves, because it was the only way to make things better for everybody in this part of the world."

"Too bad the Ilkans and the Emirate don't think so, too," Omer Astrabadi said.

"When they get tired of trying to take it from us," said Vaivan, "they'll discover it's easier to trade than raid."

"Most of the rest of the world still has to learn that one!" Alichin said savagely. "I found it out the hard way in Santa Fe!"

"So I hear," I said.

"What do you know about the International Space Commerce Conference?"

"Only what I saw on the telenews."

"That was distorted. The telenews

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networks are run by members of the Tripartite Coalition."

"Whoever runs them, they slant the news to suit their purposes. And if I've figured Santa Fe correctly, you're going to need my military background more than my skill as a pilot."

"We don't need any more military pilots," Omer said. "The Outland Brigade is at full manned strength—land, sea, air, and space."

"And we're not at war," Vaivan added.

"You will be," I told them flatly.

"I agree," Vaivan said, "and we may not have much time left to prepare for it."

Alichin looked quizzically at his sister. "Vaivan, who'd want to fight us except our neighbors? We can handle them."

Vaivan motioned to him to be silent. She rose and began to inspect the inside of the railway carriage compartment with a small plastic box.

"You're getting paranoid," said Alichin. "How could anyone bug this compartment? We selected it at random when we boarded."

"People get into trouble when they believe something's impossible." Vaivan completed her check, resumed her seat, then asked me, "All right, Sandy, what do you know about what's going on?"

I was riding in a private compartment with two armed people, neither of whom, I knew, was loathe to use weapons. I decided I'd better play it straight-arrow if I wanted to leave the compartment alive. "I only know what I get from telenews. It seemed to me somebody was setting you up for a simple looting by economic pressure. Such measures often lead to armed conflict."

"But economic pressure tactics are a long way from war," Alichin said.

"Armed conflict is a consequence of failure of economic conflict. I can give you several historical examples where failed economic pressures resulted in armed conflict fought on the adversary's terms by their puppets."

Vaivan inclined her exquisite head, crowned by a mass of dark hair kept up off her neck and shoulders in the dry heat by jeweled clips of local design and motif. "It's unusual for a warrior to have historical depth."

"I'm United States Aerospace Force Academy Class of '41."

"So? You're an educated professional warrior."

"And a bit more." It was obvious that the different culture of the Commonwealth would consider a soldier differently, as well, so I tried to clarify what I meant. "The primary purpose of a military education in the United States isn't the production of officers who can fight, although we're taught to do that, too. It's an education in the art of armed conflict—what causes one, how it starts, how to spot one that's about to start, how to win it in a decisive manner if that's the political goal, or how to prevail in a stand-off, Korean-type truce. This tells me that economic pressure is a classic precursor to armed conflict."

"Not always. Our Founders' War wasn't," Alichin said.

Vaivan added, "We know what war is."

"I don't think you do. You still call it 'war.' "

"What else is it?"

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"There hasn't been a war since the last one stopped in 1945 and everyone decided they weren't going to fight wars any more. Since then it's been called 'armed conflict.' "

"You Americans play with words like Russians," Omer said with distaste.

"War wasn't considered a consequence when I walked out of the Space Commerce Conference in Santa Fe," said Alichin. "You'll get the full story when I report tonight. Sandy, I'll be interested in learning whether the facts cause you to revise your conclusions."

"I don't believe I'm working for you yet, and I haven't taken a security oath."

"Some checking was done before you were invited to the Commonwealth," Vaivan said. "But whether you accept a position with Landlimo or not, you're our personal guest at Karederu."

"You don't have to accept our hospitality," said Alichin. "If you decide this isn't for you, you can be on your way home this evening."

In spite of the fact that I was getting all the wrong signals because of cultural gap, I was growing to like these people. They had audacity. They were certain to get into trouble with the rest of the world. I tried to apologize. "Please pardon me. I'm still an American in my world view."

"I know that," Alichin Vamori said.

"You seem insecure and defensive," Vaivan said in an offhand manner, then added, "Perhaps you might like to tell me about the situation leading to your retirement from the United States Aerospace Force."

I shrugged. "The official documents say one thing, but what happened was something else. I was there; the investigating officers weren't. And they never told me it was classified. So . . . I was on a routine proficiency flight in a Space Hawk, flight plan all tickety-boo with both Cheyenne Mountain and Wichita Space Traffic Control Center. Nothing for anyone to get suspicious about, but the Soviets probably had some bad intelligence. A Black Bear space cruiser began tailing me. When he stopped tracking and pinned targeting lidar on me, my gut reaction told me I'd better do unto him what he was about to do unto me. I zanged and shot . . . and watched him burn-in over Kergulen Island."

"The Black Bear was provoking you! Standard procedure in the *Kosmonautika*," Omer said with a grin, white teeth showing under the mustache, which stood straight out on both sides of his face.

"Well, I made the State Department unhappy, and the Aerospace Force *very* unhappy. Seems I'd violated Standing Order Romeo prohibiting aggressive action without provocation. The current U.S. foreign policy is conciliatory to the Soviet Empire. Live and let live . . . if you don't get shot first. So to placate the Soviets, I was permitted to resign / retire."

"*Bojemoi!*" Omer muttered.

Alichin Vamori said after a moment of silence, "Sounds like a flimsy excuse for dismissing an officer they'd spent a lot of time and money educating and training."

"The United States is extremely sensitive about military space activities," I said. "Both nations have enough stuff

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in orbit, including ABM space lasers, to wipe out the other's space facilities. If that happened the door would be open for ICBM thermonuclear strikes. Look at it this way: What's cheaper, one man or an armed conflict?''

''But why didn't you fight in defense of what you did? The Aerospace Force might have backed off because of the publicity.''

''You don't fight Headquarters and win. And I won't fly a keypad at Boondock Aerospace Force Base, Alaska . . . or be a 'professor of military science and tactics' at Alcatraz Military Academy for young hellions. So they allowed me to 'voluntarily resign with honor.' ''

Except for the sound of wheels rolling on rails, there was silence in the compartment for a moment before Alichin Vamori said, ''You'll be working for us Monday morning.''

The quiet, swaying ride changed. The train began to slow as it pulled into the Topawa yards. ''He's already on the payroll,'' Vaivan said. ''If he doesn't want the position, he'll be paid for today in any event.''

''But I haven't done any work!''

''I recall a recent incident on a railway platform,'' Ali said.

''Debts are always paid,'' Vaivan added.

I liked the dry heat of the Commonwealth, but I was wearing the blue slacks and blue shirt of my old uniform along with an ancient blazer that was too heavy for the climate. Having just returned from a colder part of the world, Ali wore American business garb. Vaivan was attired in an open-weave, loose cotton tunic in light colors. If I stayed, I'd have to buy suitable clothes, but I didn't yet know what kind because the Commonwealth's climate was so varied.

The intertropical convergence zone kept the storm tracks north in January, leading to a warm and dry winter season in Topawa and the coastal plains. But it was quite different in the Dilkon Range, where resorts offered some of the best all-year skiing to be found anywhere. Many people carried skis in the hot Topawa railway station.

A large alky van met us, driven by a man whom I envied greatly: Vaivan's husband, Wahak Vaya Teaq. He seemed introverted, but gave an initial impression of being a nice guy. He wore a Commonwealth pig-sticker at his waist, but he didn't look as if he'd use it.

I wasn't eager to find out. These people's apparent acceptance of personal combat wasn't my cup of tea. I preferred technological fighting: man and machine against man and machine at a distance, and may the best systems manager win.

There was only family small talk among them as we drove through the streets of Topawa. It was a fascinating capital city. It didn't look or feel like any low-tech city I'd ever seen.

In the first place, Topawa was clean, bright, and a mixture of old and new.

There were a lot of people walking. They were a mixture of racial and subracial types—Hindus, turbaned Sikhs, Arabs with and without their traditional kaftans and haiks, Mediterranean types, Africans, orientals, and Europeans. Some women, probably Muslim, were veiled. The people of the United Mitanni Com-

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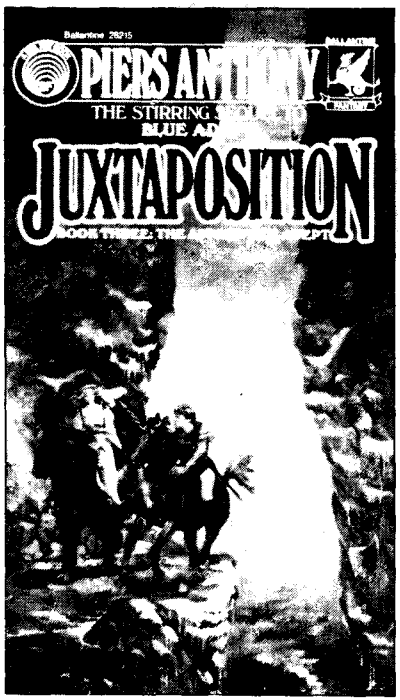

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monwealth were a mixture of nearly every type on Earth.

The same hybridization was evident in the buildings. Some showed the influence of past European colonizers—the Portuguese, French, Germans, and British. Some were built of an interesting intermix of native red sandstone and the abundant steel and glass produced in the Commonwealth. A few looked new: lacy and airy structures made from space-produced composite materials.

The streets were laid out squarely, the work of a surveying crew rather than a herd of cattle. Various vehicles ran in the wide, straight streets—alcars, fotofuellers, and electric trolley cars. The vehicular traffic was disciplined; the Commonwealthers actually did lane driving. I saw no human- or animal-drawn vehicles. There were a few automated traffic signals, but most traffic was directed by a human policeman in the middle of an intersection.

Some of the Commonwealth's factories were probably highly automated in order to produce competitive goods in the world market. But in other nooks and crannies of the culture, people were used instead of machines. The Commonwealth had a population of about three million. One of the national problems was finding work for everyone because of the Commonwealth rule: Everybody works at something, because there is a lot of work to be done.

I'd been told that, in the Commonwealth, you worked unless you were a tourist, visitor, or guest. The Commonwealthers were known for taking good care of their sick and infirm by family means if possible and by charities otherwise. They'd deliberately eschewed most of the trappings of the welfare states. I began to understand their emphasis on family ties.

Karederu was situated on a low bluff on the south side of the Topawa River valley, in which the city nestled. It didn't have a wall, but any unwanted visitor would have to get through the surrounding thick vegetation.

Inside, the spread of about a hundred hectares seemed more like the suburban subdivisions of the old American metroplexes.

Ali would be my host, since he was unmarried and had a spare room. Wahak Teaq stopped the van to let us out. "Seems like a rather large estate," I said, looking around at the open land, upon which small cottages were scattered so that they were private dwellings.

"That's the wrong word," Ali said. He picked up his bag and began to walk toward the nearest cottage. "Karederu is a concession to the old lifestyle. Each family unit has its own dwelling. We'll go over to the Center about sunset for dinner."

Alichin's place was a small, self-contained home. He tossed his bag into one room, told me to pick another, then switched on the cottage electricity.

I felt suddenly tired, fatigued, and somewhat nauseated. "I feel lousy, Ali. Probably my circadian."

"I was on the same flight from Denver and Paris, so my rhythm's in sad shape, too," he said. "A short nap with subliminal circadian reprogramming will take care of it."

I had the mental discipline to handle the disoriented semi-confusion of circadian asynchronization because of my

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space experience. This was different. Through the nausea that was beginning to wipe out everything else in my mind, I suddenly knew what was happening.

"Ali! Turn off your electric power! Grab the main switch! Hurry!"

He took three steps and fell on his face.

I crawled toward an electrical switching box on the far wall of the kitchen . . . and got to it before the nausea overwhelmed me. With practically my last bit of strength, I pulled the main switch.

The nausea disappeared immediately.

When I opened the panel, I found what I'd suspected. I pulled the little plastic box out, ripping loose the two wires that connected it to the mains. When I staggered back to the main room, Ali was sitting up and holding his head.

"You okay?" I asked.

"Yes. What was it?"

I held up the little black box. "Somebody planted a killer ERG here."

"What's that?"

"Earth resonance generator. The Aerospace Force uses them to protect sensitive facilities. It modulates the terrestrial magnetic field in the vicinity. I don't know how, since I didn't have a 'need to know.' It can kill in minutes by disrupting neural activity."

Ali held out his hand. "Vaivan's technicians will want to have a look at it."

I gave it to him. In America it was classified Top Secret. But this wasn't America.

"That's twice in one day," Ali said.

"Put it on the tab," I told him. "It would've killed me, too."

"As far as I'm concerned, you're one of us," Ali said with finality. He went to the kitchen, put the black box away in a cabinet, and brought back a bottle and two glasses. "*Supaku,*" he said, and poured a glass of the clear liquid. "Recycled rocket propellant. Free choice!" He raised his glass in a toast and downed it in one gulp in the manner that Russians drink vodka.

It had high ethanol content and could have been used for propellant. It burned all the way down, hit bottom, then spread its warmth outward from my belly. I began to feel better.

"I want to see what telenews is saying about Santa Fe. I've been out of touch for about twelve hours. Got any particular choice of telenews nets?" Ali asked.

I wanted to find out, too. "No. They're all biased."

"Which one do you think is the least so?"

"Try Weltfenster. It's Swiss."

"Oh? Are they non-biased on world affairs?"

Ali might be testing me, so I told him, "They've been a neutral porcupine for centuries."

"Ah, the North American mammal covered with spiny quills! Well, so's the Commonwealth. But what makes you believe Swiss reportage is any less biased?"

"With Hong Kong and Bahrain, they're bankers to the world. Most politicians are either in hock to them or stash their loot with them. They don't have to toady to anybody."

"You've got a lot to learn, Sandy! Let's see what the unbiased 'World Window' telenews people have to say."

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Alichin instructed the receiver to interrogate the Weltfenster net, search for all news records of the International Space Commerce Conference for the last twelve-hour period, record the subsequent data dump, and present the menu. There was a lot. Ali found a video report of interest and punched it up.

The segment opened with a long shot of the Santa Fe conference center. It was the usual talking-head opener. "Good evening from Santa Fe," the reporter's image began. "The agenda of the International Space Commerce Conference here was altered today by the walk-out of the delegate from the United Mitanni Commonwealth, Alichin Vamori." Cut to tape showing Ali striding out of the meeting. "Vamori, a leading member of one of the ruling families who control the Vamori Free Space Port, lashed out at the Conference, claiming the proposed space commerce levy was nothing more than, in his words, 'a 21st-century version of the old protection racket.' According to conference organizers, the purpose of the space import-export levy is not only to reduce the citizen tax burden in those nations which have subsidized space utilization for the past fifty years, but also to aid the world's non-space nations which don't benefit yet from space industry and power." Cut to a view of the chairman of the conference making a speech. The reporter continued, voice-over, "The reaction of other conference delegates was swift. Not only did Vamori's walk-out precipitate an early acceptance vote of the proposal, thereby short-cutting what might have been prolonged debate over minor points of difference, but it also resulted in the acceptance of an amendment which imposes a boycott against non-signatory parties. Thus Vamori's actions have backfired on the United Mitanni Commonwealth and the profitable Vamori Free Space Port. The success of the boycott remains to be seen. It cannot help but reduce the activity at Vamori Free Space Port, which now handles more than forty percent of the world's space commerce. Gran Bahia, the world's other free space port, obviously stands to gain, but Bahian spokesmen had no comment when Weltfenster queried . . . "

Ali switched it off and sat there.

I broke the silence. "They set you up."

"We knew that was going to happen," Ali replied with apparent calm.

"I hope you're prepared for the consequences."

"We think we are."

"Militarily?"

"That, too."

"Is that why you wanted a military pilot?"

"No. Landlimo Corporation placed the advert before the Santa Fe conference. We've always needed all the help we can get."

"How do you know you won't get into another Chase situation?"

"One Colonel Joseph T. Chase is enough for any country," Ali said, referring to the man who'd been defeated by Ali's grandfather that Christmas Day fifty years ago. Ali looked directly at me, his piercing dark eyes seeming to bore right through me. "We've never turned down help, but we're careful these days to see to it that history doesn't

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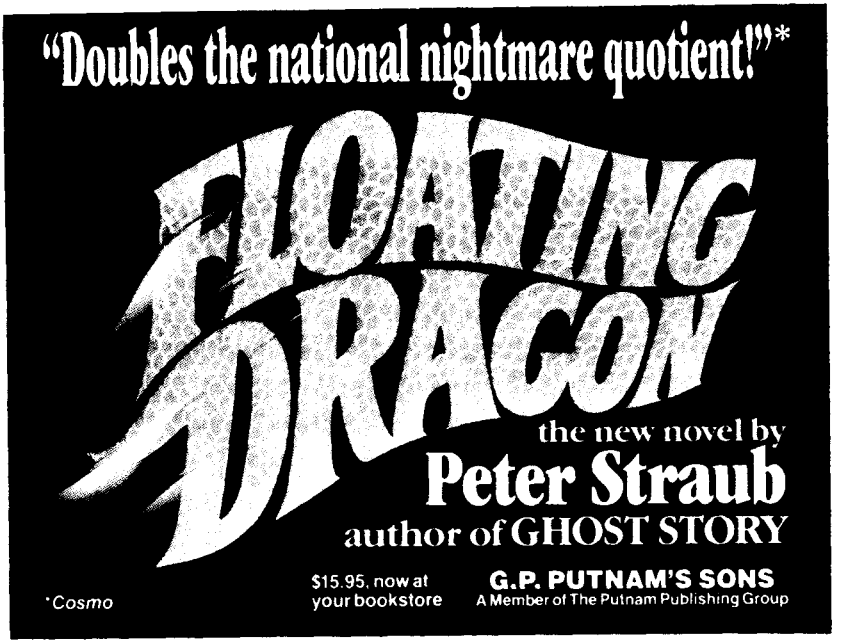

repeat itself. We can use your help, Sandy, but it will require your total commitment."

"I want to know a lot more about the job," I told him flatly, staring back with equal intensity.

"You'll get what you want." Ali got up, stretched both arms out to his sides, and flexed his fingers as though he were releasing great tension. When he looked at me again, he was the pleasant, controlled Alichin Vamori I'd gotten to know on the train. "Until dinnertime, why fret? I'm going to take a nap. I suggest you do the same."

When Ali shook me awake, the light of day was fading.

"What's the dress for dinner?" I asked.

Ali was wearing khaki shirt, shorts, and knee socks. His dagger hung at his side. He shrugged. "Clothing used to be a badge of rank to signify relative position in a group, but today we have more subtle badges. We don't wear anything special except at diplomatic meetings or business conferences, where we dress in the manner of those we're conferring with to make them feel more secure and more pliable in negotiations. Wear what you want; everyone else in Karederu does."

I pulled another blue shirt and blue slacks out of my single bag. I shaved because the twenty-four-hour stubble on my face wasn't enough to qualify as a beard and because I noted that this culture favored clean-shaven men—except in the case of Omer Astrabadi, who was following his outland custom.

We walked together through the open compound in the evening light. "You've

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got what amounts to a private park in the Commonwealth's biggest city," I said. "Is this typical of the lifestyle, or just of the ruling families?"

"The former. And forget the shibboleths of the telenews. 'Ruling families' is a semantically loaded term. 'Rule' is a null-word. Ergo, so is the word 'ruling.' You've seen the wealthy and powerful in America. Notice anything different about the way we behave?"

"Yes. Why do you use public transportation? You can surely afford better, if for no other reason than security. I can't figure out why someone as important and wealthy as you doesn't have his own aerospace plane and limousine."

Ali replied quietly, in a matter-of-fact tone, "We were ordinary people once and still are. All we wanted was to eat regularly, raise a family, run our own lives, and make and trade things. When we saw that the world wasn't going to pieces and when we got access to the comm/info satellite networks, there were enough people like The General who'd had enough of bemedalled, strutting tyrant leaders and corrupt politicians. Why don't I have my own aerospace plane and limousine? Why don't I live in a great castle? Why aren't there a lot of servants around? Sandy, even in your culture the ostentatious display of those things isn't necessary in order to live well and do business successfully. And they create envy and covetous desires among those who'd rather take them away instead of make them by their own efforts. Why should I alienate my own people and my customers? Most successful businessmen found this out. This is a world of plenty, if people would only realize it."

"You mean, all Commonwealth families live like this?" My initial contact with the Commonwealth was causing culture shock.

"No, some families are bigger and have more land. Some prefer urban living in blocks of condos. Many Vamoris are either out of the country or in space enough so that we savor the feeling of Earth when we're here." Alichin Vamori paused, then added, "Besides, The General likes it. Most of his generation worked hard to gain this security."

"I didn't see any security fences or gates when we came in. Look, you were the target of terrorism twice this afternoon. Seems to me you need a compound with very tight security."

Ali grinned. "It's secure."

"Without fences and guards?"

"You've told me that the U.S. Aerospace Force doesn't use physical barriers and human guards around its sensitive military installations now." Ali walked along briskly. "Don't try to get into Karederu except through the gates where the security screen will recognize you and not make a fuss."

"Then how did the killer ERG get into your cottage?"

Ali looked puzzled. "I don't know. The only way it could have is if someone known to the security computer brought it in."

Karederu Center was a large building with a gently sloping roof and overhangs coupled with open-wall construction that let the tropical breeze through. It had kitchens and other rooms, but I saw

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only the big hall filled with about two dozen people.

Alichin first introduced me to the most important man there, the patriarch of the Vamori family and the near-legendary founder of the United Mitanni Commonwealth.

General Anegam Dati Vamori, Victor of Oidak and First President of the Commonwealth, was older than the country he'd helped found, yet he didn't look what I knew to be his age. I wouldn't have been surprised at this in any high-tech country, where apparent age is a consequence of biotechnology and biocosmetics. He took my hand in both of his and told me, "Welcome, and thank you."

Aides must have told him of the railway station incident. "I did what was necessary, General."

General Vamori smiled and shook my hand gently. "A properly trained warrior always does—within the proscribed bounds of his culture. I'm sure the Black Bear pilot was doing the same. In any event, thank you for bringing your audacity into our camp. It's not often appreciated in high-tech, but we'll always welcome new infusions of it."

"I'm sorry. I thought you were referring to the incident this afternoon," I said.

"That, too. It would have been a disaster if you hadn't been as honorably motivated as you are."

"I'm a military man, but I don't like to brawl."

"I'm sure you don't. But it's impossible to perceive of you as other than an honorable, duty-bound person in the way you look, act, move, and speak."

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"Pardon me, but I wasn't aware of it."

"Perhaps I can make you understand by a negative example," General Vamori said. "If one acts like a slave, one will be treated like a slave."

I suddenly understood why this mixed bag of people hadn't gone the way of former colonials in other low-tech nations, but had pulled themselves up in fifty years by bootstrapping in a way most people in high-tech couldn't understand.

"But the obverse is also true, sir."

"And that is . . .?"

"If you act like you have something of value, somebody will try to take it away from you."

"We can prevent that, if we've done our planning correctly."

"Pardon me, but what can a business corporation do that your military forces cannot?"

"Wage energy warfare."

"We haven't briefed Sandy yet," Ali told The General.

"It's time you did," I said.

"Patience," The General replied smoothly. "You'll learn more tonight, Sandy."

"And if I don't like it?"

"You'll like it. It involves a fight, and you're a fighter." The General wasn't entirely correct. "Ali, make Sandy feel at home. And tell Vaivan I applaud her selection."

This old man may have had extraordinary insight, but I doubted it. Or he may have caused a thorough background investigation to be made—which I also doubted, because there hadn't been time since the Black Bear incident.

But I did admire him for his openness. He was an old tiger, but far from a toothless one.

I knew why everybody addressed him as though his rank were capitalized.

I liked The General.

But I wasn't quite ready yet to fully trust him or any of his family.

The first reaction of anyone to a new place—even if one relocates only to a new city—is feeling like an outsider, not trusted or trusting.

Maybe I was getting the wrong signals. Maybe this was the way these people operated.

I was surprised to discover that *all* Commonwealth women were attractive. Even Alichin's mother, Canela Nogalu Vamori, who was old enough to be my mother, exuded an exotic attraction. The younger women—cousins Sila Tatri Vamori, Komel Tatri Vamori, and Emika Nogal Kokat—seemed deeply involved in the Vamori enterprises, yet they didn't let business matters interfere with the obvious fact that they were female.

The only one who seemed vaguely and strangely uninterested in me was Tsaya Vamori Stoak, who wasn't in the least unattractive. She seemed cool and detached. I couldn't figure her out. As a result, she fascinated me.

I began to wonder how these armed women made love. Fearlessly, I suspected, and on their own terms. Women who go about armed are *not* second-class citizens capable of being coerced against their will.

Would I be offered the guest privilege here? Would I be allowed to choose, or would I be chosen instead? It could be an interesting evening.

I recalled The General's admonition

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against acting like slaves. These people were in control of their lives. Male or female, they were not people to fool around with.

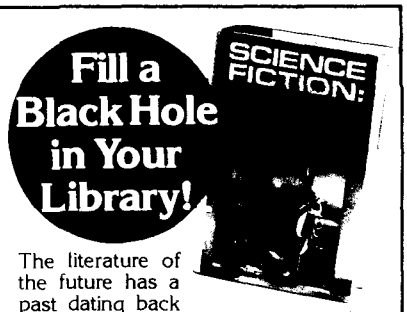
The children present reflected this. If the Commonwealth had second-class citizens, they were the children. These were far from the service brats who were the only children I'd had contact with. They were obviously under the control of their parents with no nonsense being tolerated, yet they didn't seem to be suppressed. They knew their place and appeared to be proud to occupy it. They seemed to know that someday they'd join the ranks of the adults, and looked forward to that. These were proud people, and they inculcated their young with that pride at an early age.

Until I learned more about this culture and its people, I decided I'd act as politely and inoffensively as I could. I wasn't certain of all the niceties of Commonwealth custom, but I rather suspected from my brief encounter with it on the railway platform that it was a matter of "well deserved" if someone got it while carrying out an act of perfidy or violence. Maybe it wasn't justice in the Anglo-American style, but it apparently worked here.

What would happen if they let me in on their secrets and I decided not to join them? Could I get out of the country alive?

On the other hand, they'd taken me into their trust, and I had to reciprocate.

Not everyone I met had a Commonwealth name. A short, stocky, bald man walked up, introduced himself as Hein-



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rich von Undine, and bowed slightly as we shook hands. He wore a business suit whose white shirt collar looked two sizes too small and little round metal-framed eyeglasses, even in this day of advanced biotechnology. He was with the Chiawuli International Exchange and Factoring Company, he said, and handled most of the outland financial transactions of the Vamori enterprises.

"Haven't I seen something recently on the telenews about an American named Baldwin? Would you be related to him?" I'd expected a thick Teutonic accent, but he had none. His speech was Commonwealth English with its musical inflections and altered vowel sounds.

"I shot down the Black Bear."

"Then your presence makes sense," von Undine said.

Ali and Vaivan came over and steered me away from von Undine. Ali asked his sister, "Vaivan, *why* is von Undine here tonight? Who invited him? This is strictly internal Commonwealth business!"

"Kariander Dok and Tonol Kokat were very insistent."

"I don't like him," Ali said, "but I don't know why."

"We've been dealing with him for a long time," said Vaivan.

Ali, Vaivan, and Wahak took me in tow for dinner. It had been a long time since I'd been to a pot-luck faculty supper with my parents in Santa Barbara, but that's what this dinner amounted to. Each part of the family brought something. The result was a trencherman's paradise.

"Everyone loves my guacamole and refried beans," Ali said. "If I hadn't been outcountry, I'd have been told to bring some. Personally, I think my Texas chili is better, but . . ."

"Where did you learn to make that?"

"In school. We've all brought back favorite recipes from places we've been."

We proceeded down the table covered with dishes from around the world. "Tell me," I asked Ali, "are there any native foods here?"

He shook his head. "No, but you wouldn't like them anyway."

"Why?"

"We don't like the native specialty people such as The General had to eat during the war. Canine meat's too tough and gamy. And occasionally you'll hear the old insult." He spoke something in the Gallo language, full of clicks and glottals.

"Which means?"

" 'Some day I'll eat you.' "

I didn't bring up the subject of local food again.

Karederu Center was equipped with fully automatic kitchen equipment, so no one had to do the dishes or take out the garbage. That meant everyone could get right down to business after dinner.

The General didn't preside. The meeting was called to order by Ali's father, Rayo Sabinos Vamori, eldest son of The General. The conference extended beyond Karederu Center via interactive voxvideo displays, which revealed Commonwealthers gathered in their own centers and others located all over the world and in space.

I thought of a dozen ways someone could tap the net.

Vaivan guessed I was thinking about it. She said, "The subcarriers on our leased transponders don't use standard encoding, Sandy. *I* don't even know

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how it's done, even though I handle security matters for Landlimo Corporation and Commonwealth Space Transport—ComSpat. It's something like pseudo-random noise coding with frequency shifts and jumps combined with multichannel switching. Aunt Roseiada —the older lady sitting over there—is the only one who knew the software program."

"Past tense?"

"It's so complex that only the master computers remember it."

"Difficult to crack."

"Impossible, Sandy."

"Didn't you tell me about the dangers of believing something to be impossible?"

"Seven levels of serial encryption coding would require more time to scan than remains in the life of the universe."

"Everybody on?" Rayo Vamori stood before the assembled group and the banks of video display screens.

Other members of the Vamori family were on the net, as well as some families I hadn't heard of yet—Stoak, Tatri, Abiku, Fehat, Delkot, Kom, Dati, and Chiudi. Commonwealth given and family names sounded vaguely familiar. I didn't know whether their sounds were distorted slightly by the Commonwealth accent or whether they were indeed altered.

Some of the participants were definitely outlanders. Each identified himself, as part of meeting protocol, although it was apparent they were known in the group—the Chungs from Hong Kong, the Wangs of Singapore, Missamaghad Phalonagri of the Madras Bank, Hadayadha-ben Mukhalla of Dhahran, Captain Kevin Graham of the League of Free Traders at Vamori Free Space Port, the round-faced Skinner "Trip" Sinclair in Houston, and two who were obviously

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in the weightlessness of a space facility, Jeri Hospah and Ursila Peri—whose attractiveness was apparent in spite of the effects of zero-gee on her face.

I was asked to stand for introduction. "Sandy Baldwin, former captain, United States Aerospace Force, now of Landlimo," was the introduction Rayo Vamori intoned . . . and I hadn't yet formally joined the company! But now everyone involved in the operation knew me, and this meeting would certainly bring me up to speed on what was going on and *why* they needed a military aerospace pilot.

"I still haven't said yes," I whispered to Ali. "How do you know I won't snitch to my former employers?"

He shook his head almost imperceptibly. "As an academy graduate, you hold personal honor high on your list of priorities. You won't twig to anyone, for the simple reason that I ask you not to—whether you come with us or not . . . which you will, I'm sure."

He was right. I was already in and swimming with them . . . against the tide, perhaps. And even if I didn't go along with whatever they were planning to do, I wouldn't run back to the Aerospace Force or any other American organization, not after the way I'd been treated for doing my job.

"Alichin Vamori is back from the Santa Fe conference," Rayo Vamori began. "We knew what was likely to happen, so we weren't caught totally unprepared. Some, but . . ."

"Did you believe they wouldn't move as they did, Vamori?" said Phalongri of Madras.

"We were surprised."

"But we had adequate advance intelligence data." Wen-ling Chung of Hong Kong.

Rayo looked at Vaivan, who said, "We had good data, but some didn't believe the Tripartite would really go through with it."

Trip Sinclair in Houston broke in. "I've got to agree with Vaivan. Most of my colleagues here didn't think the Tripartite had the guts . . ."

"They did," The General interrupted. "Never mind recriminations. Perhaps some day there will be time to analyze everything that led up to this. But we can't afford that luxury now. Let's get on with what we must do."

"We'd best start with Alichin's report," Rayo Vamori said.

Ali stood and walked to the center of the group, where he would have the best view of the gathering at Karederu Center and the displays showing the other participants. He inclined his head toward one of the video screens. "President Nogal, you'll get my formal report as soon as I draft it and put it in your computer. I'll be happy to make an informal verbal report to the Executive Commission . . ."

The image of a middle-aged man said, "Most of the commission is on the net, as well as the Chairs of the House of Trustees and the House of Directors. Time is of the essence."

Ali took a deep breath. "I didn't relish representing the Commonwealth in Santa Fe. I didn't trust the people who set up the conference, and I didn't trust the people who participated. They're puppets of their respective power groups. But since all of you believed I knew more than anyone else in the Commonwealth about space activities of interest

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to us. I accepted the appointment reluctantly. Once appointed I tried to act in the best interests of all of us. If anyone has a serious complaint of a personal nature concerning the way I handled things in Santa Fe, arrange to meet me and wear your iklawa."

Ali was a good speaker with an excellent command of the English language. In addressing his group, he shifted out of his Commonwealth accent into one that was universally heard on the comm/info net. People in high-tech countries tend to forget the comm/info net is used more in the low-tech world than anywhere else, because information is vital to existence in low-tech. I found myself wishing that more people had taken advantage of it as the Commonwealthers had.

"We knew in advance the conference was rigged," Ali went on, "but none of us anticipated that one hundred and eighty-six nations would support the tariff agreement. We thought we'd find *some* support for the Commonwealth amendment."

There'd been nothing on telenews about any Commonwealth amendment to the Santa Fe space tariff agreements.

"But the conference was on the home ground of the Tripartite," Ali continued. "They knew where everyone was quartered in Santa Fe. They could establish communications easily any time they wanted, whereas I had difficulty reaching reps from other countries who'd given us indications of supporting our free trade amendment. The Tripartite obviously made a prior arrangement with the PetroFed and probably also the Socialist Hegenomy. They had *everything* worked out in advance. The conference was intended only to put official approval on the tariff agreement by the governments involved."

"They don't really believe the Commonwealth legislature is going to change the basic laws of this nation to install tax collectors at Vamori Free Space Port, do they?" the Commonwealth's president asked incredulously. "Even if the legislature managed to do it, the Board of Jurisprudence would rule it unconstitutional the first time somebody brought suit."

"We'd bring suit immediately," said Captain Kevin Graham of the League of Free Traders from his spaceport office. "Vamori-Free is absolutely essential to the continued operation of free traders in space. In fact, the League itself—to say nothing of other traders — couldn't exist without Vamori-Free."

"Was the conference made aware of the internal problem of the Commonwealth in implementing the Santa Fe tariffs?" asked Vaya Volkatu Delkot, manager of the Vamori Free Space Port. She was a lovely woman who would have looked more at home in the high-fashion studios of Paris, Beverly Hills, or Tokyo.

"Very few people in high-tech understand the Commonwealth," General Vamori said. "The Tripartite and other power groups probably didn't believe their own evaluations, projections, and intelligence sources. That's been their history. They've lost a lot of conflicts because of this, but they've won more because they control capital. They don't control ours and never have. Fifty years ago we made sure they couldn't. It didn't bother them then; they wrote us off as an impractical experiment that

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couldn't succeed in light of the history of this continent. We were an impossible institution; therefore, we wouldn't continue to exist. We did. And, as we anticipated, our success threatens the foundations of their power."

"South Africa," said Wen-ling Chung of Hong Kong, "was a highly successful experiment that got nipped before it became a threat."

"It took longer there because only small power groups were involved," Trip Sinclair said from Houston. "The Diamond Trust and the Gold Debasers have been in bed with the Eurobanks for centuries."

The General interrupted. "We've all been taught history. We must now write some history of our own. We must modify Phase Two because of the boycott amendment adopted after Alichin left the conference. Does anyone have a copy of that yet?"

"I do," said Vaivan.

"So do I." It was Trip Sinclair. "You're getting pretty fast, Vaivan."

"Or you're slowing down. I've got much the same channels that you do."

"Perhaps. But mine work through several Good Old Boy networks here in the States."

"How do we know we aren't being penetrated by Tripartite intelligence agents right now?" Ali asked.

"We're penetrated," Vaivan said. "I'm reasonably certain they have agents on this net."

"Our only defense is their historic inclination to disbelieve the reports of their intelligence operatives and analysts because the reports don't agree with their world picture. The world's run with very little real knowledge — mostly by hunches, emotion, and sheer wishful thinking," The General said, and admonished Ali, "Let's get back on track."

"Trip, give us a rundown on that amendment. All I know is what I heard on Weltfenster a few hours ago," Ali said.

The Houston attorney looked to one side and punched his office keypad. We couldn't see what came up on his VDT, but he told us, "To summarize the main points: signatories to the conference tariff document agree to boycott non-signatory organizations. Note that I used the word 'organizations.' That's the way they phrased the amendment."

"Apparently they realize that Commonwealth space commerce activities have no political regulation," Vaya Delkot said.

"Yes, the wording is such that the boycott will affect *all* space commerce activities carried on by the Commonwealth and its registered space facilities," said Trip Sinclair. "Even the League of Free Traders, Kevin."

"How about our Lagrangian operations?" It was Ursila Peri, speaking over video. "How can they boycott trade operations off-planet?"

"Is your air bill current, Ursila?" Trip asked.

"Yes, but even if it wasn't, nobody out here would cut off another person's life support. If the credit line got overextended by too much for too long, we'd put the debtor on a ship home. We work together because there's a lot of nothing waiting for everybody beyond the bulkhead. They're going to have trouble enforcing tariff arrangements and trade boycotts out here. That agreement sounds

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exactly like something written up by a bunch of people who always have pressure around them and gravity to keep their feet on the floor. Earthworms!" She made it sound like an insult.

"That's what I mean about changing the planning for Phase Two," The General said, but with more insistence this time. "We didn't consider a boycott as a viable option for them. They made the mistake of believing it to be workable here and in space. Therefore, we're ahead of them in several respects. And we've got to revise our programs to take advantage of this. Look at the elements of our situation."

He didn't have to move into voxvideo pickup range; the pickups moved to him instead. He began ticking off his points on his fingers.

"One: They don't understand us, but we understand them, even though we don't have them as thoroughly compromised by espionage as we'd like. However, what advantage we may have in their lack of understanding may not last, because the Japanese members of the Tripartite can tell them all about this sort of thing from both sides of the fence. I'm referring to Tsushima, Pearl Harbor, and Space War One.

"Two: They're big and we're small. Therefore, we can move faster and in novel directions. We can put them off balance and keep them that way if we're innovative.

"Three: They're certain to squabble over the spoils as these begin to come in from signatories to the tariff agreement. This will slow them down and consume some of the time and effort they'd otherwise direct toward us. Greed born of scarcity plays a big part in their lives. On the other hand, all of us know there's more than enough for everyone.

"Four: The tariff agreement and the boycott amendment are unworkable off-planet. We can certainly take advantage of that, because it meshes with existing plans for Phase Two. It will take them some time to discover how unworkable it really is. That's time we can use to our advantage.

"Five: We can further distract them by purporting to go along with their game, but being forced by our own internal politics to change our national laws. This is a stalling tactic to allow us to get our own programs set up. That gives us more time.

"Time is on our side if we use it wisely. We must not squander it because, unlike the rest of the universe, it isn't plentiful."

While The General spoke, *everyone* there and on the net listened. The apparent leadership power of this man was uncanny. I felt as though I were listening to a modern messiah.

"There's always some common ground for negotiation in anything, including this situation." It was Heinrich von Undine. Some people present looked at him with severely sharp expressions. "Ali, perhaps your actions in Santa Fe were a bit precipitous—although I intend that only as an observation after the fact. The Commonwealth has existed for fifty years, and there's a great deal of foreign investment here. The aid and assistance of foreign corporations and consultants have been hallmarks of Commonwealth progress. In short, the people you believe are out to despoil the Commonwealth by destroying our free trade activities may simply be acting in

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their own self-interest. Try to see it from their point of view. The watchword of *weltpolitik* for a century now has been co-operation, not physical coercion."

"I cannot agree with your assessment, Heinrich," The General countered with grace I wouldn't expect. "Once we became big enough to threaten the major world power groups—and therefore worthy of their attention—they chose not to co-operate with us but to bring us under their control. When they discover they can't do it, they'll try to destroy us. We'll have no recourse but to fight. However, we'll fight on our terms, not theirs."

General Vamori looked around, then continued, "We can win if we change the game. We can utilize the new element in the world power game: space. It's a game element they don't realize exists. We do. If we carry out all the proper actions at the proper time, we can defuse this international situation and create a new world power game based on the reality that we live in a system of plenty, not scarcity."

His resonant voice suddenly dropped. We could barely hear what he said with great sadness: "But if it indeed comes to armed conflict, we will have no recourse but to defend the Commonwealth proper and perhaps participate in what may become, God forbid, Space War Two."

Ali broke the silence that followed his grandfather's words. "The first action in the revised Phase Two program lies in your hands, President Nogal. May I suggest that you make a public announcement on telenews dismissing me for poor judgment because I walked out of the Santa Fe conference and damaged the position of the Commonwealth in the community of nations? Then banish me to space, where I can't cause any more damage."

Wen-Ling Chung said, "But, Alichin, that would dishonor you and you would lose face."

"Not really, although anyone outside this circle would react as you have, Wen-Ling," Ali replied. "A banishment for poor judgment provides President Nogal with logical justification for getting me out of the picture, and gives him an excuse for making apologetic sounds to various governments about my behavior while promising to rectify things. I'm leaving for Ell-Five as soon as possible. Any questions?"

"Yes." It was Kariander Kokat Dok of Topawa Finance & Investment Bankers, Ltd. He got heavily to his feet. He was a large, pudgy man with soft features and a mode of attire that was extravagant in this group. Ali had introduced him as an uncle by marriage on his mother's side. My first impression was that Kariander Dok enjoyed a profligate lifestyle quite unlike those of the people around him. The earring in his left earlobe would have marked him as a sado in America, but I didn't know if the custom held in the Commonwealth. His wife, Tanyo Nogala Dok, showed none of the traits usually held by the opposite half of such a pair. I rather doubted that any psychological deviation of that sort could exist in Ali's family, so I was probably getting the wrong signals again.

Kariander Dok continued with a pleasant smile, "Alichin, are we facing

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the possibility of invasion? Surely you must have some thoughts on this."

"No invasion, but they're more dangerous than we originally thought. Their careful and complete casting and orchestration of the Santa Fe conference tells me they don't want co-operation or negotiation; they intend to eliminate us as competition, a common practice in the business world. But I don't believe we face a military threat."

I got to my feet and called out, "Ali, as an outlander, may I make an observation?"

Ali acknowledged me. "We always appreciate hearing the viewpoint of a newcomer who may not be enamored of the prevailing logic. What do you see here that I don't?"

"First, I agree you've been brought under economic pressure, but it isn't intended to eliminate you as competition. Armed conflict is more probable. Consider a historic analog. When the Meiji put Japan on the road to industrialism, Japan was without the native raw materials necessary for an industrial state. They could have obtained those by negotiation, but they didn't know how, because they were still a feudal culture accustomed to using military force. Europeans and Americans had developed and were dependent upon the same resources the Japanese needed and threatened to take. Europe and America reacted by denying those materials. The final blow came when the United States embargoed trade and cut off eighty percent of Japan's petroleum. The Japanese then believed they had no recourse but military action, which they took."

"What has ancient history got to do with what's happening now?" Kariander Dok broke in.

"If history doesn't repeat itself, at least the *patterns* of history do," I said. "My point is this: the economic pressures being applied to the Commonwealth aren't necessarily a prelude to elimination of the Commonwealth as competition, but to destroy a perceived threat. The United States, Japan, Bahia, and the Saudis won't attack you; you aren't a military threat to them. What your adversaries really want is to carve up the Commonwealth among your covetous neighbors—who may be called upon to carry out the military actions. This will probably be done in a way we least expect. I know nothing about what you're doing except what I've heard here tonight, but that's the way I see it." I sat down.

The General said, "Rayo, he may be right. Abiku, it would be wise to put the LandImpy and AirImpy on a higher level of readiness, but don't activate the CitImpy yet because it would reveal we're anticipating something. Let things develop first. Implement Phase Two and accelerate it. Alichin, proceed with the space aspect at once. Kevin, your captains should be alerted to expect SMAT."

Rayo Vamori nodded at each recommendation his father made. If I was watching a "kitchen cabinet" at work, it was obvious who the leader was.

"Should we first see how well their boycott works," asked Vaya Delkot of Vamori Free Space Port, "or should we embargo *them?*"

Trip Sinclair said, "We've already been through that. It's got to be business as usual. Except for goods already in the pipeline, the Tripartite may be able

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to make the boycott stick—if not by financial pressures, then certainly by political moves. However, a certain amount of trade will go on, because not all large companies have Tripartite connections and can work around the restraints. According to my preliminary estimate, we can expect an initial sixty percent reduction in activity from North and South America and perhaps as much as seventy-five percent from Japan. I can't estimate Europe at this time, but maybe Heinrich can."

Von Undine got to his feet. "I anticipate a complete embargo of European activity through Vamori Free Space Port."

Hadayadha-ben Mukhalla said from Dhahran, "Not all European commerce is under Tripartite control. The Spanish and Scandinavians will continue to send their trade through you."

"You forget the leverage possessed by the Tripartite in nations such as mine," said Missamaghad Phalonagri. "Powersats owned by Tripartite-controlled firms provide India with a large percentage of our base load."

"Missam, we'll cover India's critical baseload." That came quietly from Shaiko Stoak, CEO of Commonwealth Glaser Space Power, Inc. He was in Karederu Center with his wife, Nyala Nogalu Stoak. I began to realize the extent to which this megafamily was interlinked.

Wen-ling Chung added, "We have the capital required for Phase Three. Trip, will Babson & Bowles or Rogers-Gates be willing to bid?"

"Babson & Bowles won't; Lyle Babson's a member of the Tripartite energy subcouncil. Neither will Rogers-Gates or Bozly Engineering in Seattle, because of in-house Tripartite-financed engineering projects."

"I'm worried about RIO's reaction," Kevin Graham said. "Our captains are concerned that PowerSat, InPowSat, and InSolSat powersats could have their power beams diverted to the American beam weapon stations on orbit . . . and we know where *every* one of them is stationed, even though they hid them in inclined Clarke orbits."

That was Cosmic Top Secret information! How had the League of Free Traders found those battle stations, shrouded as they were with hard stealth technology?

Ursila Peri said from L-5, "I don't know if the powersat crews would carry out an order to redirect power beams to military battle stations. Whether the Aerospace Force has plans for a military takeover of the powersats is another matter, but such an attempt would put them in confrontation with the RIO teams on the powersats."

That, too, was covered by the highest security classification.

The General said, "Alichin, that whole matter will depend on how well you handle the space segment of Phase Two."

"I know."

"Anything else that needs to be covered as a result of Alichin's report on Santa Fe?" asked Rayo Vamori. Nothing did. As the meeting broke up, family members collected offspring from various rooms where they were either asleep or playing. Others moved to put away equipment and check the kitchen to be sure that the robots had cleaned and stored the eating equipment.

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"Sit down," Ali told me, indicating a group of chairs gathered around a low table. "Heinrich, can you join us?"

"I'd like to, Alichin, but I have an urgent appointment with Muller. He's to call me at twenty-one hundred hours from Ottawa, and I can't keep him waiting." Von Undine seemed anxious to leave and did so.

The General and Vaivan joined the circle around the table. Tsaya Stoak offered me a tall-stemmed glass of a very dry white wine. I thanked her, and she replied softly with lowered eyes. I surmised she was shy, but with her natural beauty she didn't need to be retiring.

"Well, Sandy?" Ali asked as I sipped the wine. "Do you understand why we need a person like you?"

The wine was smooth, and its modest ethanol content would certainly relax me. "Frankly, no. I haven't the benefit of the background you take for granted."

"What don't you understand?"

I set the wine glass down on the low table. "What's this Tripartite you talk about? The PetroFed? You talk as though they're countries. I know geography, and I don't recognize them. So who are they?"

"Who do you think?"

"Probably groups of unofficially aligned nations with strong interests in space commerce."

General Vamori finished the wine in his glass and set it on the low table. He put his fingertips together and said, "As one who's been militarily educated, Sandy, you naturally think of conflicts as occurring between governments. That may have been true three hundred years ago, when the world was run by kings and emperors. But they lost their grip in the 19th century when it got expensive to run the world. Do you recall a family named Rothschild?"

"No."

"They controlled the European banking system until the French nationalized their banks."

"I never studied finance."

"Too bad. It's made the world go round in the past several centuries and it's the modern reason for the existence of military forces. Anselm Rothschild once stated, 'Give me the power to issue a nation's money, and I care not who makes the laws.' "

"So what? Government treasuries issue money, not banks."

"Not since the Rothschilds showed the bankers how to do the job," The General said. "The Rothschilds started out financing local princes. After about 1800, they started lending money to European governments. Then they saw to it that national affairs occurred so that loans were always paid with interest. In a very short time the Rothschilds controlled the money supply of Europe. They owned the banks that exchanged various national money tokens."

Ali added, "You have a folk-saying in America: 'He who has the gold makes the rules.' When you control a nation's money, you can tell kings what to do, depose prime ministers, get your friends and supporters elected to office, get wars started against competing financial organizations headquartered elsewhere, and control trade just as if you had a castle and warriors commanding a critical point along a trade route."

The General tapped his fingers together. "A hundred years ago, control

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of trade was taken *completely* out of the hands of politicians and governments by the bankers because they had the money to make things happen. These financiers learned from the Rothschilds and became the power groups who provided credit when treasuries went into the money markets for loans. To secure those loans, they placed their own people in positions of political and commercial power. Today these power groups have better organization, communications, control, and police power than most national governments."

"General, with all due respect, sir," I said carefully, "that sounds like something from Radio Moskva. If the capitalists have indeed taken over, they would have revealed it through their inevitable excesses. Absolute power . . ."

"No, Sandy," The General said, "there isn't one big, monolithic power group. There are a *lot* of power groups. There's been continual competition to see who'd be in control at any given time. It's the only thing that's kept the world from being destroyed in thermonuclear general war, because such a holocaust is unprofitable to *every* power group. Small, local brush-fire wars often can be to the advantage of one power group in its struggle against another, but any war like the two World Wars of the last century is now counterproductive to the purposes of modern power groups."

"Those are our adversaries," Vaivan Teaq said. "Not national governments, which are only front organizations to maintain obscurity and anonymity for those with the real power. Since the Founders' War, we've been careful *not* to ally ourselves closely with any major world power group, for reasons that should be obvious."

"Who are these people?" It all made some sense, although it didn't track with *anything* I'd been taught.

"You never hear of them," The General replied. "Their credo says their names should appear in the news when they're born, when they're married, and when they die. They don't need and don't want publicity or recognition. That dilutes power."

"Yes, but you've hung names on them," I pointed out. "Who are they?"

"Here in the middle of the 21st century there are four major ones," Vaivan said, ticking them off on her long fingers.

'One's the Tripartite Coalition — financial interests from the Americas, Europa, and Japan. Then there's the Socialist Hegemony, which isn't socialist but state capitalistic, and large enough to be viable even without economic efficiency. The Petroleum Confederation—PetroFed—is the remnant of OPEC that still possesses an enormous amount of well-invested capital generated by their old petroleum cartel."

Her brother added, "The biggest unknown is the so-called 'Yellow Peril': mainland China. They lost Space War One, and they've spent the decades since developing their technology base. They're gaining control of their population and food situations. That means they might be a candidate for a future top group, although they don't have the energy resources right now to do it."

"Then there's the Commonwealth," I said, "on the way up."

"We'll never be the top group."

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Wahak shook his head. "We're like the Dutch: too few people."

"But you're using high technology in a low-profile manner. That gives you leverage you couldn't otherwise possess, in spite of your small size."

Vaivan said, "The only leverage we have is alliances with other small power groups who don't threaten each other."

"Which you appear to have," I said, "if my analysis of the people who were on the telenet tonight is correct."

"You're learning," Alichin replied.

Vaivan suddenly held up her hand for silence. "Did you hear it?"

"Hear what?" I asked.

"Listen!"

There came a muffled "thunk" followed shortly by another one. A pause, then a quiet rattle like a brief rain shower falling on the roof.

"Out!" Vaivan suddenly shouted in a voice much louder than I thought her capable of. "Everybody out of the Center! Now! Move!"

She was on her feet, had her brother by the arm, and was on her way toward the porch surrounding the Center.

I followed without asking questions. There's a time for talk and a time for action. Talk time was over. I didn't know what the small noises were. Vaivan apparently did.

Once outside, Ali and Vaivan put distance between them and the building. Again I followed suit. I got the fleeting impression that many other people were fleeing the building.

Karederu Center blew up in a strange explosion.

There was a blast of heat and a muffled, low order boom. I knew there'd be a shock wave, so I hit the grass.

One of the Vamori women was running beside me. As I went down, I took her with me, shielding her with my body against the heat, the blast, and the flying debris.

I felt the sharp point of a knife low on my torso, in a place where I don't like knives to be sticking me because I hoped to have children some day.

"Let me go, or you'll lose them!" the quiet feminine voice came in my ear.

I'd pulled down and landed atop Tsaya Stoak, the shy young thing who'd served wine. She wasn't a bit shy with that little dirk in her hand!

"Sorry! I was just trying to shield you," I tried to explain, as I rolled off her onto the lawn.

"Oh, no!" It was both an expletive and a moan of disbelief as she looked behind us.

Karederu Center was fully engulfed in flames that towered in a huge column toward the night sky, thundering with a roar like a waterfall. The center of the building collapsed on itself.

Alichin and Vaivan sat together on the grass not two meters from us. The shocked look on Vaivan's face had stripped away her beauty and replaced it with a mask of horror. She obviously was appalled at the ruthlessness that had led to the bombing.

Ali's expression was hard and determined, and it was he who recovered his wits first. "Everyone! Head count! And let's get in as close as we can to see if anybody's caught inside!" he yelled above the roar of the flames.

A cry came, "Where's The General?"

"Oh, no!" Tsaya Stoak exclaimed.

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"He's got an arthritic hip! He can't move as fast as we did!"

A short, stocky form suddenly raced through the group of people on the lawn. He had a blanket or shawl over one arm and he'd pulled his white shirt up from his back to cover his head.

"Omer! Stay out of there!" It was Vaivan who recognized the Kazakh.

"I see The General!" came a muffled shout as Omer Astrabadi threw himself into the inferno.

Ali was right behind him.

I watched transfixed until Vaivan shouted, "Get water hoses! Get water on them and around them!"

Nobody could exist long in that holocaust, but Ali and Omer were out in seconds. They carried and dragged a form between them. Ali's shirt was on fire.

I got to them first and pulled Ali away from The General's body. Others rushed up to help Omer.

I extinguished Ali's shirt. He was grimacing in pain but didn't cry out or whimper. Someone had turned on the lawn sprinklers so that a mist of water covered us. Someone else had found water hoses and was playing them over those of us who were close to the flaming building.

Ali was badly burned over his shoulders and torso.

"Easy, easy!" I told him. "We've got The General."

"He looks bad," Ali managed to grunt between short gasps.

Five people had carried The General across the water-sprayed lawn to a spot under a walkway floodlight. I followed with Ali, who was in great pain from his burns now.

Tsaya Stoak stepped up to Ali and tore away the remains of his burned cotton shirt.

"Don't touch him!" I shouted. "You could infect those burns! Get a doctor!"

"I'm an M.D. *and* a witch doctor!" she yelled back.

In spite of her odd comment, I was tremendously relieved.

"Just first-degree burns over about twenty percent of your body, Ali," she told him. She ran her hands over his neck and shoulders, then placed her fingertips on both sides of his neck. For an instant she seemed to be intensely concentrating on Ali. "Better?" she asked.

"Yes. I'm all right if nothing touches those burns."

"I'll start therapy as soon as I take care of The General." Tsaya turned to where the old man lay on a collection of blankets.

"How is he?" Ali asked.

Her tone was grave. "The General has second- and third-degree burns over about eighty percent of his body. If we don't act fast, he'll die."

"Where's the nearest burn trauma hospital?" I asked. General Vamori was an old man. I didn't know how good his heart was, but it was obvious that his extensive burns would require the finest biotech facilities. I didn't think the Commonwealth had them.

"Vamori Free Space Port," said Omer.

Of course! A space port would have facilities to handle very complex burn cases.

But Tsaya broke in, "No, I want him in the Haeberle Clinic at Ell-Five. Easier on his cardiovascular system and easier

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to rejuvenate the burned areas without keloid tissue."

"Omer, are you all right?" Ali asked.

"*Da*. I went into the fire with my white shirt pulled up to protect me—is called a Baikonur Fire Safety Suit."

Fire control aerodynes were circling the area discharging suppressant. Other aerodynes bearing the blue hex-kreutz of medevac began settling to the ground.

In spite of his burns, Ali seemed to be suffering little pain. He began to organize things. "Wahak, get medics to bring a pyro trauma tank here! Omer, get on the comm and alert Vamori-Free so the *Tuito* or the *Tonolia*, whichever's on dirt, can lift for Ell-Five ass-ap." He looked at me. "Sandy, are you with us?"

I liked these people. I liked their openness and their unwillingness to knuckle under to coercion. But they badly needed the leadership of the man who lay mortally burned on the ground beside Ali.

Time to fish or cut bait.

"Yes. We'll discuss details later."

It was the quickest and simplest decision I'd ever made. In the long run, it bound me more than any formal oath I'd ever taken.

"Can you find your way back to my cottage?" Ali asked.

"Yes."

"There's an aerodyne parked there. Get it over here. Start code is one-one-two-zero-zero-one. Mnemonic: the founding date of the Commonwealth. All our vehicles, including spacecraft, will respond to that start code, even overriding their everyday start codes."

It was a Mitsubishi Victoria. The alky tanks were full. While the turbine was spooling up, I ran the preflight. It was important to make sure the slot valves operated properly because they controlled the Coanda Effect lift. Most people have never seen an aerodyne except in the Smithsonian or the Deutches-museum, but they were all we had for vee-stoll flight before lift drives.

The inferno of Karederu Center had been extinguished by the time I got back.

The General was now immersed in the liquid of the pyro trauma tank. Ali had liquid compresses and synflesh dressings over his burns. I tried to be helpful, but it was Ali who supervised the loading of the aerodyne. He asked me to fly so that navigation could be handled by Omer, who knew the route and the Vamori-Free layout.

As four medtechs put The General's tank aboard, Vaivan walked up to Ali and me. She was carrying a crossbow.

"We got the team of two," said Vaivan. "They're Ilkans."

"The crossbow came from Kalihol," Ali said as he looked it over.

"Some of their equipment is Chibka," Vaivan added.

"Nice neighbors you've got," I said. "Why don't you patrol your borders?"

Vaivan shrugged. "It just costs money; doesn't prevent anything. These items are commonplace. Cee-oh-two capsules for misting a hundred milliliters of alky. Incense punk for an ignition source. Both capable of being strapped to a crossbow bolt, and a crossbow powerful enough to reach a hundred meters from the road over the hedge and onto the roof of the Center."

Damned simple! Almost any flam-

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mable liquid could be aerosoled easily into a vapor explosive, which would be laid down on the roof surface within seconds. Then all it took was the arrival of the bolt carrying the punk.

"Vaivan, send what's left back to the respective countries," Omer suggested. "Do it so it is not known how the remains got there, but so there is no question about who they were."

"I'm quite capable of conducting counter-terrorist operations, Omer." Beneath the beautiful and cultured exterior of Vaivan Vamoru Teaq lay something quite violent. My brief contact with Commonwealth women had convinced me the females had self control, but were capable of violence if required. I understood why Vaivan was in charge of the security of Landlimo Corporation . . . and who knows what else in this tightly interwoven operation.

I didn't ask questions at that point. I'd find out soon enough. I was with them, and I was glad of it. I didn't want to be considered an opponent. Whoever had decided to crack the whip over these people was certain to learn that they'd tickled a tiger. The results would either be long and bloody . . . or short and even bloodier.

The aerodyne acted a lot differently with four more people aboard. Although I was hyped-up with adrenalin, I discovered I was getting fatigued, because some of my reflexes weren't as fast as they should have been. With an additional load of almost 400 kilograms, the aerodyne took a lot more slot flow to break ground and, once out of ground effect and clearing the trees, it frisbeed as its stability computer felt out the correct control responses and altered the program accordingly. I managed to stay right side up.

"Come to a magnetic heading of zero-four-seven," Omer instructed me. "Climb to a hundred meters. That's high enough to clear towers and buildings. Press to maximum cruise."

The computer said maximum permissible airspeed with the present load was 209 klicks per hour. It set the power and slot openings to enable that.

The lights of Topawa slid underneath us.

"Get a course line on my hud," I told Omer. "I'm not going to fly with my head in the cockpit arriving the Space Port." Omer acted. Within three seconds, the data flashed on the windscreen display in front of me.

"Topawa Track, Mitsubishi seven-one-four, medical emergency, over Topawa at one-zero-zero, heading zero-four-seven, going to Area Seven-three, Vamori-Free," Omer spoke on the comm to air traffic control.

"Seven-one-four, contact and track. Seven-one-four is cleared to Area Seven-three, Vamori Free Space Port, present heading. Maintain one hundred meters. We're clearing your corridor now."

"Seven-one-four, acknowledged."

"Traffic one o'clock going to twelve o'clock, two clicks, altitude confirmed at five zero zero."

"Tally ho!"

This was a time when I thanked the system for working properly. I was fatigued, flying an unfamiliar vehicle, and under pressure.

As we cleared the urban area of Topawa and headed out over the darkened countryside, Omer said, "Follow the road." The lights of the vehicles on the

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highway formed a necklace of brightness that pointed toward a far glow that had to be the lights of Vamori Free Space Port.

Ali leaned forward between our seats. "Omer, Wahak couldn't get a crew for the *Tonolia* on short notice. The crews are on holiday leave. Can you handle it?"

"With some help," he replied curtly.

"I'm in no condition to help. Tsaya's pain block won't last much longer, and I'll have to let her use chemical pain suppression. That'll destroy my mental alertness. You'll have to pilot."

"I say again: I need help. *Toreva* Class packets can't be flown easily with one pilot."

"Sandy?"

"I'm not certificated for that class, Ali."

"Certification be damned! The ship's registered to the Commonwealth, and the Commonwealth will *ex post facto* certificate you."

"I'll need a check-out."

"How much?"

"I don't know. I've never been in the *Toreva* Class."

"Yankee," Omer said to me with a grin under his huge mustache, "I thought you were a hot jock from the U.S. Aerospace Force, whose pilots can fly anything that'll get off the ground."

"When you put it that way, I'll manage, Russkie. Just show me where the abort switch is. I'll figure the rest of it out."

"With my help, Sandy, you can hack it. We'll smoke that can to Ell-Five as fast as its delta-vee capability will permit."

I really didn't need Omer navigating the aerodyne. ATC kept feeding me vectors to keep us clear of Vamori-Free traffic. And I couldn't have missed Vamori-Free unless I'd been blind or on the gauges. It stretched out along the coastline and lit up the night sky. Its ramp, pad, and runway lights caught the haze of the ocean to create a corona effect above it.

"Seven-one-four, Vamori Air Track. Pad at twelve o'clock, two kilometers. Report it in sight," the comm barked.

Omer pointed ahead. "Vamori Track, seven-one-four has visual on the pad."

"Seven-one-four, the pad is yellow. I repeat: The pad is yellow."

"Roger, Track. Acknowledged," Omer said. "Seven-one-four requests clear."

"Seven-one-four is clear to leave frequency."

Omer directed me to set the aerodyne down to the left of the pad. I had my hands full; I didn't get the chance then to see more than a launch runway with a hulking grey shape sitting on the start end.

The transition from aerodyne to space ship was fast. The pad crews had been alerted for our arrival with the critically injured General. There was a van waiting to transfer us. Six men wrestled the pyro tank aboard, and we clambered in behind.

"How is he?" Ali asked Tsaya.

The doctor was checking the readouts of the portable biodata pack. "I've got him stabilized," she said briefly in that soft voice of hers. "I won't let him die." She obviously knew what she was doing, and went about it in a quiet and totally competent manner belied by her quiet shyness. She was a pro.

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The *Tonolia* looked familiar as we got out of the van at the pad. I said as much to Ali. "She should," he said. "The *Tonolia* Class packets were built at Vamori North Yards. They took the best features of the Arguello Yards' *Tribal* Class packets and mixed in some characteristics of the Osakhi *Hiko* ships."

"I can smoke her," I told him. "The Aerospace Force *Hopi* Class ships were the military versions of the commercial *Tribal* Class, and we used those birds for training and proficiency missions as well as liaison sorties. Is she as insensitive to payload as the *Tribal* Class?"

Omer nodded as we reached the access stairs to enter her fuselage. "I make rough calculation. We mass three-eighty kilos all together. She'll lift a metric ton to lunar orbit, so we really move now. What gee limit, Doctor?" he asked Tsaya.

"No limit. The General could be boosted more than ten gees in the tank."

Ali spread his arms to reveal the pseudoskin bandages over the burns on his arms and chest. "These won't gee-limit me, either. I'll be on my back."

"Then we boost at whatever STC approves for limiting acceleration," Omer said, as we followed the men carrying the pyro tank into the open hatch of the *Tonolia*'s fuselage.

The *Tonolia* was slightly different from the *Hopis* I'd flown. The difference lay in the fact that a lot of American-type redundant technological frills were missing. The *Tonolia* was a plain-vanilla high-performance high-efficiency Earth-to-space commercial hot rod, a Commonwealth copy of a Japanese version of a highly successful American design.

I settled myself in the right seat and fastened the harness. The panel was strange at first. As I looked it over and began to locate the basic controls and readbacks, the habits I'd learned in the *Hopi* utility corvettes began reforming into patterns for the *Tonolia*.

But I had some hesitation going through the power-up check list with Omer. Mad Russian Space Jockey he might be, but he was amazingly patient with me that night. Never once did he reach out to touch a control whose location he knew while I fumbled over the panels trying to find it. Never once did he tell me where to look; he let me find things myself so I'd know where they were if I had to find them again. He was in no rush.

Having powered up, he ran through the pre-clearance checks, and I found myself gaining confidence. It had been over a month since I'd logged time in similar Aerospace Force ships.

"Ready to lift. Inform STC and get our clearance," Omer finally told me.

"Vamori Departure Clearance, this is *Tonolia*. Ready for launch, Area Seven-three, clearance request on file," I told the local element of Vamori Space Traffic Control. "I hope Wahak or Vaivan or somebody filed for us as they were supposed to," I added, but only to Omer.

"They said they would, so they did," he replied flatly.

"*Tonolia*, Departure Clearance. Stand by on up-link for computer flight plan load. Five minutes and running."

I got the indication that the STC computer had fed the clearance to our onboard computer, so I punched up the

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display to check the clearance. So did Omer.

"Cleared for only two-point-four gees," Omer noted with disgust. "Withhold acceptance. Ask for a three-gee boost. Tell them med emergency."

I did, but neither of us liked the answer. "*Tonolia,* unable your request for higher boost. AmSpace Command informs Wichita Center high boost will breach the engagement zone of critical American space facilities in GEO with a closure rate that's too great. Sorry about that."

"Can we get full boost if we delay launch?" I asked.

"Stand by." There was comm silence for a moment while Vamori Space Traffic Control center queried their North American counterpart, then replied to us, "*Tonolia,* if you want to hold for three-point-five hours, Wichita will clear high boost."

Omer shook his head. "*Nyet!* Look at cleared flight plan data, Sandy."

"Vamori Clearance, *Tonolia* acknowledges computer load of clear flight plan and accepts," I told them when I saw that our lower-boost clearance would give us an arrival time two-point-three hours earlier than waiting for a high-boost clearance.

"Roger, *Tonolia,* two minutes and running. Stand by for transfer to auto."

"We've got it, Clearance."

"Contact Departure."

It was standard procedure from then on. At one minute, the floodlights came on, illuminating the kilometer of takeoff lane ahead of us that stretched eastward toward the shoreline and the Maro India beyond.

"Rails? Sled launch?" I asked.

"Easier on tires," Omer said. "Rail slippers are cheaper."

What else should I expect from a free-enterprise operation? The *Tonolia* had retractable wheels like an aerodyne, but only for Earth landing. For launch, the ship with its landing gear retracted was perched atop a simple rail-mounted framework.

The launch procedure was slightly different from military practice. The main aeroturbines didn't initiate start-up at minus-five; the sequencer put them into start mode when the sled's linear motor was energized.

The *Tonolia* made a standard one-gee launch run. Her aeroturbines were full thrust by the time we rotated at 100 meters per second, a little over ten seconds after the sled began accelerating down the track at one gee.

"Lift off!" Omer called as the ship began to climb out.

"Gear up!" I called out of habit, reaching for the control. But it was up already. I'd acted without thinking. "Correction!"

"You were right," Omer observed. "Gear *is* up! Keep cool stool, Sandy! Call two gees and sonic."

The mains throttled up as we ascended, and acceleration rose to flight plan level. Two gees came on schedule. So did sonic velocity. The *Tonolia* wanted to do more, running light as she was. We could have packed as much as four gees without straining her, but we didn't have clearance for it.

I found myself thinking it must have been fun in the old days before traffic got heavy and vulnerable Earth orbit facilities so numerous that space vehicles required flight clearances to make

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sure there were no engagement zone intrusions. Now it was computer-controlled and human-monitored, according to the international rules of the road for space.

Our flight plan called for a direct ascent—no climb into parking orbit and apogee boost from there to lunar orbit. *Tonolia* was a hot rod; she didn't need those minimum-energy trajectories. I liked her. She jumped when booted in the tail.

Other than keeping tabs on our computers and verbally communicating with STC for security, Omer and I didn't have much to do during the hours it took to get to Lagrange-Five. But we couldn't leave our posts. In spite of computers and automation, humans still supervise and monitor the autosystems. Things had gone wrong in the past. In fact, Space War I would never have happened if people had been in space and monitoring the automatic systems the day the sky burned.

I didn't get the chance to go aft to check The General's condition, but we got a report when Ali came up to the flight deck. "He's stable. The tank saved him. We've had a bit of trouble, however. The gasket on the upper membrane started to leak when we hit zero gee. Can't get it stopped."

"Bad leak or a seep?" I asked.

"Just a seep, but it creates liquid globs back there."

"Forget it. Gaskets are designed to leak. I've never seen one that didn't," I said. "Use the relief tube to suck up the big globs."

Omer indicated the X-, Y-, and Z-plane displays to Ali. "*Moy preeyah-tyel*, there is more than normal movement of traffic out here today."

Ali peered at the displays. "Which ones are military vessels?"

I told the computer to kill all blips except those transmitting on beacon codes assigned to military vessels of the Americas, Bahia, Japan, and Europa. Although slightly less than half of the Earth-Moon system was blocked by the mass of the Earth, the display showed a freckling of targets nonetheless.

"Tape that," Ali told me. "And do it again every fifteen minutes. When we get to Ell-Five, I want our people there to start taping all military activity. We'll want some computer analysis of the most active facilities."

"You think the Tripartite is moving things around?"

"Yes. Sandy, I'd like you to confirm our data on the locations of the inclined geosynch Aerospace Force facilities when we get to Ell-Five."

It was a good time and place to chat, because the *Tonolia* was free-falling out to L-5. It didn't take much to monitor displays in this mode, and things were quiet. It had been a bit hectic since I landed in Topawa those long hours ago. Although I hadn't slept except for a nap at Karederu, I felt pretty good. I had my second wind, and I knew I was effective for at least another twelve hours.

"Was I hired because of what I know about American space facilities and operations?" I asked.

"No, but we'll need what you know about the law of modern armed conflict. The Commonwealth is signatory to all the various Geneva and Manila Conventions," Ali told me. "Some people don't follow them, but we're going to."

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"I find that strange, in view of the rather strong and forceful ways of Commonwealth justice I witnessed."

"We're a very law-abiding people," said Ali. "There's a wide variation in the degrees to which we use *lex talionis*. Some people think it's barbaric and savage; but it's very effective when wisely and compassionately applied. We try. We play by the rules, especially internationally."

"Uh, Ali, the Commonwealth's not known for having a very strong government, much less a strong foreign policy," I said, and added, "In fact, the Commonwealth's a very low-profile operation. I'm sure you can protect your system internally. But your capability to handle external threats seems very weak."

"That's exactly how we want to be perceived. A cat is a furry, purring piece of lap fur unless you anger it. Then it has claws."

"What are the claws of the Commonwealth? They're not obvious."

"We've developed a special solution because of our need to keep a low profile until we were big enough to survive," Ali said, gazing out the forward windows at the blackness of space. "Others tend to look to our foreign office, which isn't very strong *by design*. They don't look elsewhere because they don't understand our free-market philosophy of economic abundancy. Sandy, we have a very powerful foreign service. It's capable of diplomacy or conducting a decisive economic war. You're part of it now. It's the Landlimo Corporation."

Back then, Lagrange Five wasn't a big unified space facility but a collection of habitats, factories, power plants, and military complexes in lunar orbit. There's an identical region called *El-chet-teereh*—or L-Four in English—sixty degrees ahead of the Moon, where the Soviets have a facility that includes, among other things, a military complex. They don't talk about it, but the U.S. Aerospace Force knows about it. The Aerospace Force has military facilities at L-5, and they don't talk about it, either.

It was a "balance of space power" affair.

The Aerospace Force permitted other organizations and nations who were members of the Ottawa Pact to use L-5, provided rules regarding the Space Defense and Identification Zones were scrupulously followed. Nations belonging to SocDef called at L-5 only occasionally.

Omer piloted the *Tonolia* during approach. In my fatigued condition, I might have botched it.

A docking crew from Commonwealth Space Transport and Forwarding Corporation—ComSpat, for short—was waiting in the portlock.

So was Ursila Peri, whose enthusiasm for seeing Ali again was evident. "It's *so* good to have you back!" Ursila said as they embraced with a fervor I hadn't seen him exhibit before.

"Let Tsaya treat these burns first, *moapa*," he replied.

"Then we've got some catching up to do." She had a slight accent, almost British except for a tendency to round her "o"s and clip her consonants. "How's The General?" she asked anxiously.

"I'll know more when I get him to

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the Haeberle Clinic," Tsaya said, helping guide the tube-festooned pyro tank out the hatch.

Although we'd met by video during the telecon, Dr. Ursila Peri in the flesh was much more vital and animated. I could well understand Ali's feelings toward her. She possessed a classic female attractiveness which provoked and excited. Like a veil that reveals yet hides, Ursila seemed to have something she wasn't showing. That excites men.

"Come, Ali," said Tsaya in her cool, professional fashion. "I must get your burns under treatment, too."

"I'll tag along," Ursila said. "You can bring me up to date."

Ali called out to someone supervising the transport of The General's pyro tank, "Jeri, come over here, please."

A long-faced, long-limbed, almost skinny man floated over to us. He grinned and said with mock obsequiousness, "You bellowed, sir?"

"Sandy, this is Jeri Hospah. Don't let his attempts at humor put you off; sometimes he means what he says. Jeri, find a sack for Sandy and issue him some chits. Then fake up some paperwork that will keep the Ell-Five people happy."

"Right-o! Your wish is my command, oh glorious leader." Jeri had a slight accent, perhaps British Londoner, perhaps lower down-east American—I couldn't place it. "I'll take care of him."

Jeri chatted as he led us through the station. Omer obviously knew where we were going, but I was so bushed I didn't care. It was all sort of blurry and confused. Jeri showed me a cubicle with a sleep sack. I didn't even bother taking off my dirty blue slacks and shirt.

Uncountable hours later, I awoke and felt physically refreshed but still mentally fatigued. Someone had left a flight suit and a Remain-Over-Night kit. Jeri Hospah was either thoughtful or had a well-trained station crew. The RON kit had a pack of chits—air, meal, water, airlock cycles—as well as an L-5 facilities directory and a visitor's card for the Free Traders' Lounge. A note was in the kit. "Call me at 96-69-54 and I'll chit you breakfast—Jeri."

I took a sponge bath, put on the flight suit and slippers, and decided I might live if I had breakfast. I called Jeri. "I'll take you up on your offer."

It took only a few minutes before the hatch beeped. "Did you just get holed, or were you back-shopped that way?" Jeri said with his infectious grin as I opened the hatch and floated out.

"After almost getting killed three times in one day and making an emergency boost to Ell-Five, it's too late for maintenance. You'll have to scrap me."

"We'll get some calories into you down at the libration point libation joint," Jeri promised. "If breakfast doesn't change the lead in your ass to iron in your blood, maybe Doc Tsaya has something for tired space jocks."

"Jeri, I'm sure she has, but I don't think I'll ever get it," I said. "I accidentally fell on her at Karederu Center when the place blew, and she was within a millimeter of excising my family jewels."

"You make it sound so interesting when you use those big scientific terms,"

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Jeri said as we floated down the corridor together.

Things were still nagging at me, and I carefully opened the matter with this lanky spaceman. "Jeri, how'd you get involved here?"

Jeri Hospah didn't answer for a moment, then said, "When Ali asked me to."

"Got a contract?"

"Just a job description to satisfy the Ell-Five Habitation Committee. I staked my future on a handshake."

"Same here," I admitted as we cycled through a hatch. "Can these people be trusted?"

"Explicitly. They have a high sense of personal honor and they'll back up their behavior with their lives, if necessary."

"What's it like to work for Ali and his family?"

"I don't work *for* them; I work *with* them because they made me one of them. So I work far harder than I must. I think they know what it's like to work *for* somebody else from their colonial days and they've decided it's better to have people working *with* them instead. Regardless of what makes them do it, they're successful at it."

I had to agree. They'd tacitly accepted me into their ranks, and I was trusting the word of one man. In America I couldn't do that. I must have come from a distrustful culture.

"By the way, Jeri, what are we in?"

"The ComSpat module leased onto Ell-Five. That lets us use their power and life support systems at a lower cost than running our standbys as primes. And we don't have to step outside to go to town."

The L-5 complex was a big space station, but when you've seen one space station you've seen them all, military or civilian. Is there much difference between a military office building and a civilian office building?

On the main hatch of the ComSpat module was a secure lock with screening. I was used to security in military facilities, but it surprised me to find it in a private one. But why not? Most businesses on Earth require screening in the lobby.

Ali was with Tsaya in the lounge. "My cousin's a good doctor," he said, anticipating my question as we joined them by tucking our legs under the table. He spread his arms, which were now covered with an open-mesh dressing. "Zero-gee makes this a lot easier."

"You have only first-degree burns," said Tsaya Stoak in her quiet way. "There's no need to hospitalize you. In fact, it's better for you to move around."

"How's The General?" I discovered I had the same sort of concern in my voice as any Commonwealth citizen.

Tsaya replied, "He's resting comfortably now with glucose and water I-V and maintaining proper urinary output. He'll be on an oral diet tomorrow. The third-degree burn areas are already granulating because there's no pressure on them, so I'll be able to start cloned skin grafts much sooner than I anticipated."

"You like to work out here, don't you, Tsaya?" Ali said.

"Yes. It allows me to do things I couldn't on Earth."

I noticed that one member of our welcoming committee wasn't there. "Is Ursila joining us?"

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"Unfortunately not." Ali's voice held a tone of disappointment. He explained, "Until you get current in our ships, we're short-handed. Both Ursila and Omer are out-base right now. Pulling the *Tonolia* out of Vamori-Free screwed up our ship scheduling and sequencing."

We ordered from the menu console, and Jeri delivered our orders from the dispenser when they were ready a few minutes later. As we ate, I remarked to Tsaya, "I apologize for frightening you at Karederu Center. I was trying to protect you from flying debris. I really didn't have anything else in mind. Your reaction—uh, rather surprised me."

Tsaya inclined her head and replied with the characteristic shyness she exhibited when discussing anything but her profession. "I, too, apologize, Sandy. I wasn't sure you understood our ways yet."

"I don't, but I'm learning. Tell me what I did wrong."

"Most outlanders and tourists don't realize that we're taught to defend ourselves so that we can enjoy an equality and freedom not available to many women in our part of the world. Ours is the only continent where women deliberately make themselves unattractive as a defense measure. We've broken with that tradition," she said, then added, "In the confusion, I'm afraid my cultural indoctrination came to the fore."

"Does it always?"

She smiled shyly and replied, "Not always." She didn't say anything more, but she'd given me a lot of encouragement—not only for herself, but for Vaivan.

"Well, what's our next move in the

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great chess game in the sky, Boss?'' Jeri Hospah asked Ali.

Ali gave him a brief rundown of what had occurred since the teleconference. ''When we've finished here, I want to get my sister on the comm. I need an update on what's happened since we left Topawa.''

''And everyone will want to know about The General,'' Jeri said and sighed. ''It's been like a recording: 'How's The General? How's The General?' In the Top Twenty and gaining hourly. Going gold this week for sure.''

''I've already reported on The General's condition to Vaivan,'' Tsaya said. ''She told me the Karederu fire was the biggest news in the Commonwealth. It even made the international net because of The General. A lot of people wanted to know the extent of The General's injuries.''

''I'll bet!'' Ali growled. ''Well, it's difficult for terrorists to get to him here with all the security laid on by Landlimo Corporation.''

I'd wondered about the strange name of the company since I'd first heard it. ''What's 'landlimo' mean? Is it an old Commonwealth word?''

Ali shook his head. ''Do you remember a language called Esperanto?''

''It wasn't taught at the Academy.''

''Probably not. It was created as an international tongue in the nineteenth century,'' Ali said. ''Two things kept it from being accepted. First off, it was based on Romance languages because Europeans were running the world then, but most people don't speak languages with Graeco-Latin roots. Second, like it or not, the comm/info revolution of the last hundred years made English the international language of education, business, commerce, and transportation, poor as it may be semantically and difficult as it is for people to learn. That's always been true of the languages of conquerors.''

''Hold on!'' I objected. ''We haven't conquered anyone since World War Two.''

''English is the language of those who conquered the world technologically.''

''If that's the case, it should be a combination of English and Japanese.''

Ali shook his head. ''The Japanese are like us: take the best from others, do a better job with it, and sell it by speaking the customer's language.''

''Point well made,'' I said. ''So what's 'landlimo' mean?''

''It's an Esperanto word for 'frontier.' ''

On the scrambled Landlimo Corporation conference net, Vaivan said she wanted The General to come back to the Commonwealth as soon as possible.

''I won't move him for at least another forty-five days,'' Tsaya maintained. ''It's going to take twenty days to get good cloning of his dermal and epidermal tissue, and I must do that here. Some of his burns are on joints. At his age I can't afford to take the chance of keloid tissue stiffening them. I'm also doing a great deal of reconstructive surgery.''

Vaivan looked vexed. ''Tsaya, we need him here as soon as possible. You know the hospital here is outstanding. And Vershatets redoubt is secure, so we don't have to worry about any more assassination attempts.''

''Any indication of who's responsible

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for the other three attempts. Vaivan?" Ali asked. "Did you get anything out of the crossbowmen?"

"They were Ilkan fanatics loaded with psychodrugs. They had nothing left in their minds. I sent them back to Ilkan in a suitable manner," Vaivan said without elaboration. "But Abiku put the impys on alert at President Nogal's suggestion because of the Karederu fire. We've spotted some minor troop movement in the vicinity of Khibya, but the Cape-to-Cairo Railway activity has been normal through Kulala, and there's nothing happening on the Lipuputa or Liupp Rivers."

I tried to follow her report by referring to the Commonwealth map on the bulkhead. It was the first time I'd had the opportunity to study the geography of my new land.

The Commonwealth was a typical creation of absentee rule. Its artificial borders had been determined in some long-ago, far-off conference where diplomats drew lines on maps. The southern border was the Lipuputa River, which separated it from the Chibka Socialist Republic and was the only Commonwealth boundary based on a natural feature. To some extent, the Dilkon Range formed the western boundary. The northern border with the Ilkan Empire was totally artificial, merely surveyors' lines across the Dilkons and the barren Ilkan Desert north of the Liupp River.

The state of affairs in the Ilkan Empire and the Kingdom of Malidok was evident from the abandoned railways. Only the Commonwealth had maintained and expanded the old colonial railway system to transport the natural resources they'd exploited to build the country.

"Vaivan, we may be wasting time considering a military attack on our borders," I said, indicating the map as I spoke. "The Commonwealth's wide open for about a hundred kilometers between the northern border and the Liupp, but the Ilkan Empire can't mount an attack there because they don't have the road or rail networks to provide logistic support. They'd have to use air, which means they'd need aerospace superiority."

"They haven't got it."

"I didn't think so. On the other hand, the Malidoks have a rudimentary road and rail system, but the only place they could really press us is through the Dilkon passes; so they're no worry," I said, indicating the map as I spoke. "And the Chibkas can't force a crossing of the Lipuputa because the south bank is swampy. So our critical border segment is in the northwest, where the Rhodes Cape-to-Cairo Railway goes through Kulala. Either the Emirate or the Ilkans would fight there because we're at a disadvantage; we'd have to conduct logistic support over the Dilkons even though there's a railway through the pass."

Vaivan raised her eyebrows, then said, to her brother, "Ali, since The General's incapacitated for a few weeks, Sandy should take over as our military liaison to the Commerce Congress and the Defense Commission."

"Good idea."

"But I don't know a thing about the Commonwealth's military plans!"

"You just outlined them for us."

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"Okay, what's this proposed job about?"

"As Landlimo deputy military director, you'll interface with Commissioner Abiku and his induno staff, who handle the common defense. This is necessary because they've got to defend a free-market system without interfering with it," Vaivan said.

I sighed. I was getting in deeper and deeper. "Let me think about it. There's time; we're not going to be attacked immediately. Our neighbors don't have an excuse other than territorial greed. They're weak or they'd have invaded long before this."

"Very well, we won't worry about invasion," Ali said. "But we're fighting an economic war. Wahak, is there any indication the boycott's effective yet?"

Wahak Teaq looked at hard copy in front of him. "Not thus far. Vaya reports activity at Vamori-Free has been normal and expects this to be the case for a week or so because it's not economical or practical for shippers to divert cargo en route. Trip Sinclair has refined his estimates to sixty-two percent once the system has a chance to react. That's the worst we can expect in terms of economic pressure."

I noticed on the map a symbol located northwest of the city of Oidak with electric transmission line symbols leading from it to other parts of the country. "Are you sure? Who owns the powersat that feeds the Oidak rectenna?"

"Commonwealth Glaser," Vaivan replied.

"Who owns that company?"

"About a hundred stockholders here, in Madras, and in Hong Kong."

"That's a critical facility. What happens to our baseload if someone disables the powersat?"

"It provides less than ten percent of our baseload," Wahak said. He went on to explain that Commonwealth Glaser's primary business was building and operating powersats for outland customers, and there were customers already queued up for unbuilt units. Com Glaser had twelve ten-gig units on line and was selling power to other low-tech nations. There were three more units going on line in the near future. The Commonwealth was using powersat energy internally only to keep Commonwealth technology current. Commonwealth Glaser's operating profits were retained earnings used to build more units. Until Com Glaser could satisfy all customers, the abundant Commonwealth coal reserves were being used to generate internal baseload. "We're bootstrapping, Sandy."

"Makes sense," I said. "But how are you going to fight an energy war?"

"By supplying powersat electricity to countries the Tripartite cuts off their powersat system for ignoring the Santa Fe boycott," Wahak said.

"We're energy-independent, Sandy," Ali added.

"That's obvious. But if things go toes-up, are we food-independent?"

"Yes," Vaivan replied. "The irrigation systems on the Toak Plains give us three growing seasons a year. We won't starve."

"Insofar as international trade and foreign exchange go," Wahak Teaq added, anticipating my next question, "it might hurt us a little if the Tripartite had a tight land, sea, and air embargo,

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but I don't think it would last. We export grain to brokers in Madras and Hong Kong, and they deal with the Indian subcontinent, southeast Asia, and China as drop-shippers. When those people got hungry, an embargo would be expensive to maintain. A space commerce boycott won't hold, either, because Vamori-Free is a true free port. We don't collect taxes or duties on any input or throughput because they create secondary spending. Space commerce may drop thirty-eight percent, but our tourist trade won't suffer, even if the Tripartite countries invalidate passports."

"Look. I'm sorry this telecon degenerated into a school because of my ignorance," I apologized. "How long does it usually take for an outlander to figure out your Commonwealth ways?"

"Sandy," Vaivan said, "you're not an outlander any more. I tendered your citizenship papers in Topawa today. Or do you have second thoughts?"

"No, no." I waved both hands. "I don't understand you yet. But you don't waffle and you're ready to fight for what you've got. I won't back out."

She went on, "Sandy, energy war isn't difficult to understand. Most low-tech countries will continue to do business with us in spite of any embargo or boycott. We provide value received and take very little off the top. The Tripartite may try to invoke sanctions against our customers by pulling their powersat plugs, but we'll be there with another plug. And we have a space port, space lift capability, primary metals and plastics industries, and the lunar mine and smelter at Criswell Center. Commonwealth Glaser's capable of supplying powersat electricity to anyone the Tripartite cuts off because we're building powersats with lunar materials at a much faster rate than the Tripartite companies."

"They'll react," I warned.

"How?"

"They'll go after your powersats."

"In the face of international law and the Resident Inspection Organization? The insurance trusts won't stand for it," Wahak said. "Those trusts are controlled by the Tripartite, but not even a consortium of all the Tripartite banks could possibly cover the losses. And there won't be any, because the insurance trusts will place a rather strong damper on any military powersat takeovers. Then RIO will drive in the bung."

"RIO teams are unarmed," I reminded him.

"We'll see what happens when everybody shows their cards. RIO will have to become the first Space Patrol whether they want to or not, because circumstances will force it . . . and so will we."

CONTINUED IN NEXT ISSUE

● The break in the sawtooth pattern of catastrophe and recovery may finally come about through the establishment of contact with a more advanced society—one that has already achieved stability.

Fred Hoyle

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WHY LEARN TO USE A LIBRARY ANYHOW?

Harold J. Ettelt

When man was painting his body blue, chipping flints, and doing other cool stuff, he communicated by demonstration. If he wanted to tell you how to beat up a mastodon or to get your greasy fingers out of his armadillo soup, he had to show you or use sign language. The limits of that sort of communication are obvious, especially when dealing with abstract things like God, love, or future events.

So man came up with his greatest invention: speech (there are many "greatest" inventions, but this is the right one). With speech he could communicate all sorts of ideas. He could better explain the fine points of bone chipping, tell you all about God, whisper sweet nothings, and lie about what a great savage he was. Some even posit that having a verbal language helped him think better, since he could put labels to concepts and they run through the mind/computer better that way.

All that worked out okay for a while, but the trouble was that it left no permanent record. If you wanted to know when would be a nice sunny day to wash your tiger skin, you had to ask the local witchdoctor, and if the jerk died before training his replacement, you might never find out and you'd smell pretty bad after a while and lose your friends. The span of man's knowledge, therefore, was only as great as the span of his memory. And when you live in a cave and die by the time you're 30, that's not much knowledge.

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greatest inven
could record particularly good
tribe always killed members of the
ies so they would live forever.
ast as long as the writings did. Of
objects in your hut—they cost a lot of
down there goes your knowledge. In short,

greatest libraries ask a librarian if you don't believe
stored the writings, and later, copies of the writings. They got
and more and more complex and it gave him a headache.
problem that inadvertently invented his greatest headache: the
many "greatest" headaches, but this is the right one). The
ganize the writings so that they could be found easily; he could
against fires and rats and stuff. And he could even help others use
remember where things were written up and what books held what
information, and he did it all for a ridiculously small salary. But here we
man's memory again.

made his greatest invention: the index (there are many "greatest"
but this is the right one). Sometimes called an index, bibliography,
or abstracting service, the purpose of any of these is to tell you where the
writings you want are to be found. Because the accumulated writings are so
enormous, using these indexes is about the only hope man has of being able to
find out what has been written up. Without them, much of those writings are as
effectively "lost" as if the library had burned down.

That's what libraries are, then: vast accumulations of writings in an orderly arrangement. Using them consists of knowing how they're arranged and how the indexes work.

None of which answers the question this essay is supposed to answer, except that if you don't learn how to use a library, you're effectively back to having a few writings in your hut and hoping it won't burn down.

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David Brin Ph.D

XENOLOGY:

THE NEW SCIENCE OF ASKING, "WHO'S OUT THERE?"

In the early 1960s, while the world was entranced by the spectacle of human beings hurled into "outer space" in rocket ships, a series of philosophical earthquakes shook the sedate field of astronomy. Just when the skies were beginning to seem known and familiar, all at once things changed. Stellar astronomers suddenly faced unsettling data from new classes of objects called "quasars" and "radio galaxies." There were disturbing theories about so-called "black holes." Even those who had long studied planets now found their comfortable domains invaded by geologists and meteorologists, who weren't at all shy about moving into the new territory.

It was no coincidence that all of this happened just as the Space Race was getting under weigh. New instruments and techniques often lead to upheavals in a science.

Still, the greatest intellectual challenge to the worldview of modern astronomers came in the early '60s not because of new space probes, telescopes, and computers, but because of an idea.

Starting in 1959, with a classic paper by Cocconi and Morrison, a series of articles and books were published with

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titles like *Interstellar Communication*, *Habitable Planets for Man* and, in 1966, a major work entitled *Intelligent Life in the Universe* by Iosef Shmuelovich Shklovskii and Carl Sagan. With these studies astronomers began to concern themselves with life itself.

The early '60s were pivotal for the field of "exo-biology"—extraterrestrial biology—and especially the sub-branch that dealt with intelligent life, "xenology." For the first time it was legitimate for leading scientists to publicly consider the possibility of contact with intelligent species off of the planet Earth.

Of course a lot of thought had gone into the subject previously, on the pages of science fiction novels and magazines. Many of the private discussions between authors such as Sagan, radio astronomer Frank Drake, and Rand Corporation scientist Stephen Dole grew out of ideas germinated by the likes of Clarke, Asimov and Clement during the '30s and '40s. But prior to the publication of *Intelligent Life in the Universe* the number of "respectable" papers on the subject printed in the West could be counted on one's fingers and toes.

In the Soviet Union extraterrestrial intelligence was not only considered possible, but was required by Leninist dogma. (It was assumed dialectically impossible that any advanced intelligence could be anything but socialist, of course.) When scientist I.S. Shklovskii wrote "Universe, Life, Mind" in 1962, his thoughts were widely popularized, and extracts were reprinted in major Soviet scientific journals.

In the West it took more time for scientific speculation about the distribution of life in the cosmos to become acceptable. A tradition of skepticism and rigor kept western science relatively safe from scientio-religions such as Lysenkoism, which caused so much harm in Russia. But the same attitudes made it hard for those interested in the possibility of alien life forms to bring up the subject in scientific gatherings without being criticized for "playing with science-fiction."

The older scientists who dished out the ridicule shouldn't be blamed too harshly. In squelching early discussions of exobiology, they may have been overreacting to the the excesses of earlier enthusiasts, such as Percival Lowell, the astronomer who convinced millions that there were living Martians and "networks of canals" on the red planet.

But with the arrival of the space age, resistance to "science-fictional" ideas was dealt a fatal blow. Those who had declared that "spaceships" belonged only in comic books were caught flat-footed. A new generation of scientists brought exobiological speculation out of the fringes and onto the pages of respectable journals. These men and women, who had proven their scientific credentials with solid research, came from an age group which didn't consider "science-fiction" a dirty word. Most of them had cut their teeth on the stuff.

The first time I witnessed the subject of extraterrestrial intelligence brought up at a scientific seminar was at a

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Wednesday Caltech colloquium in 1968. The speaker remarked on the remote possibility that pulsars might be beacons of an advanced civilization. They were, after all, several thousand times more regular in their repetitive "beepings" than any other astronomical radio source ever discovered.

The speaker was only partly serious, but sides were quickly taken, and it was soon very clear that most of those with tenure didn't like this kind of talk at all.

Attitudes were changing very rapidly during those years. A few years later some of those who were the angriest in 1968 applauded the loudest when Carl Sagan unveiled the gold plaque that was to be placed upon Pioneer 10, the first human artifact to be launched on a trajectory out of the solar system.

Today that plaque is famous. It, and those which followed on Pioneer 11 and the Voyagers, depict the nude figures of a woman and a man, an arm raised in greeting, a schematic of the planets of our system, and a rayed pattern of lines and binary dots representing the most prominant pulsars detectable from Earth. The pulsar map should enable any distant beings who recover the spacecraft to trace its point of origin within a light year in space, and its launch date to within six months.

Shortly thereafter respectable scientists were discussing, not whether extraterrestrial intelligences exist, but how to go about listening for signals from our nearest neighbors! Small (very small) amounts of public money were allocated to adapting radio telescopes for the search.

If the first revolution in the nascent field of xenology came on the pages of science fiction pulps of the '30s and '40s, the Second Xenological Revolution took place in the '60s, when scientists in large numbers began asking, "Where are they?"

Anyone interested in the possibilities of life outside the Earth should certainly read *Intelligent Life in the Universe*. Although some of its science is dated, it remains the classic in the field. Still, to a veteran reader of SF, *Intelligent Life . . .* may seem overly tame and conservative. For instance, the authors barely mentioned the possibility of *travel* between the stars. To investigators of that time, it seemed pointless to discuss interstellar colonization.

Science fiction has long used, as furniture, ships which bypass relativity. But to early xenologists it was dangerous enough talking about alien life forms, without risking one's scientific reputation talking about "hyperspace warpdrive" and the like. Shortcuts may lend SF a lot of pizzazz and spawn stories about galactic empires, but Einstein's speed limit dominates serious talk about life in the universe.

The gulfs separating the stars are vast. And during the '60s it seemed unlikely that even the modest velocities allowed under Einstein's edicts could ever be reached economically.

Thus the first era of modern scientific xenology (from 1959 to about 1972) dealt with the possibility of intelligent life springing up in isolation—here and there on fertile planets scattered across

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the sky—islands of intelligence separated from one another by vast distances and for all time.

The Age of Innocence

What could early students of this new science say about extraterrestrial life forms? No matter how daring, they were faced with one major limitation: a near total lack of data. The only known case of intelligent life is here on Earth. Until the Viking mission, some held onto Percival Lowell's dreams for Mars. Now the evidence seems to weigh against finding even microbes there. Putting aside, for the moment, speculations about dolphins, whales, and gorillas, it's pretty hard to extrapolate a graph from only one data point.

Still, three scientific discoveries and one useful philosophical tool gave researchers the courage to make crude estimates about the distribution of life amongst the stars.

The first discovery came when it was found almost ridiculously easy to make amino acids, and other precursors to living matter, from abundant molecules such as methane, ammonia, and cyanogen. Stanley Miller subjected a water solution of these substances to electrical discharge and ultraviolet radiation and got an organic "soup" in short order. Leslie Orgel of the Salk Institute accomplished the same thing by a freezing process. The high pressures of ice formation not only gave up amino acids, but the purine adenine, as well. (Adenine is one of the four building blocks of DNA, and is the core of ATP, adenosine tri-phosphate, which controls the energy economy of the living cell.)

So many mechanisms have been found, that can change crude precursors into "biological" molecules, that organic activity seems almost an automatic consequence of the distribution of chemical elements in the universe today.

The second major discovery supports this point of view. During the last two decades, radio astronomers—listening to narrow emission lines from interstellar space—have discovered great clouds of complex molecules: ethylene, formaldehyde, ethyl alcohol; some even claim evidence for—you guessed it—adenine.

(Astronomer and science fiction author Sir Fred Hoyle, looking at starlight scattered from interstellar dust, thinks that the dust itself may actually be something akin to bacteria . . . living cells about a micron in size, in diffuse colonies spanning light years and outmassing suns. It's an extravagant speculation, but fun to think about.)

It's clear then, from basic chemistry and radio astronomy, that the basic materials for life are out there. What about the right environments? We have to assume, until we have reason to think otherwise, that complex life must grow and evolve to intelligence on planets orbiting stable stars. Are there other "nursery worlds" like the Earth?

There are plenty of stable, long-lived, G-type dwarf stars like the sun out there . . . about 6% of the galaxy's several hundred billion stars. Are there planets circling many of them?

The data are still poor. It's hoped that the Space Telescope will tell us more

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about the companions of nearby stars. Some scientists think there is good evidence that at least one of our neighbors, Barnard's Star, has possibly two dark companions a bit more massive than Jupiter.

We do know that F, K, and G-type dwarf stars rotate much more slowly than larger, hotter stars. The sun contains 99.9% of the matter in the solar system, yet it has only 0.5% of the angular momentum. The rest is distributed among the planets of the solar system, especially Jupiter. Most astronomers believe that those slowly rotating stars which aren't members of multiple star systems have to possess dark companions that were used to "dump off" excess angular momentum early during star formation. Recent models of gas cloud condensation tend to support this belief.

We've covered three discoveries, then, that help us believe that it's reasonable to talk about life outside the Earth. What is that "philosophical tool" we mentioned that caps the legitimacy of xenology? It is sometimes called the "cosmological principle," or the "assumption of mediocrity."

Since Copernicus, astronomy has been a series of lessons in humility, all leading to the conclusion that "there is nothing special about where and when we are." First the Earth was displaced from the center of the Solar System, then the Sun became a nondescript traveller in orbit about the rim of the galaxy. The galaxy became merely one island universe among billions, and the universe seems to have no "middle" at all.

The cosmological principle tells us we should avoid the temptation to think that there's anything unique about the Earth in space, time, or situation. It is the major philosophical underpinning for the new study of Xenology. It forces even the most cantankerously conservative astronomer to admit that someone, somewhere, might be peering up at HIS stars, among which insignificant motes is our own sun.

If Xenology has some justification, then, where did the first generation of scientific xenologists get their numbers? How did they estimate the population of our galaxy . . . or the probable distance to our nearest neighbors?

The Drake Formula is the most popular way to guess at the possible distribution of technological species. It was invented by Frank Drake when he was at the Arecibo National Radio Observatory. It remains the most widely accepted tool for xenological speculation.

Let N = the current number of technological civilizations in the Galaxy. Then,

$$N = R\ P\ n(e)\ f(1)\ f(i)\ f(c)\ L$$

Here R is the average rate of production of suitable stars since the formation of the galaxy, approximately one per year. (The current rate is slower. R is an average that includes the burst of star creation early in the galaxy's history.) P is the fraction of stars which are accompanied by stably orbiting planets. Factor n(e) is the average number of planets per system which have the requisite conditions to support life.

The other factors include f(1), the

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fraction of these congenial planets on which life actually occurs, f(i), the fraction of these on which "intelligence" appears, f(c), the fraction of intelligent species that attain technological civilizations, and L, the average lifespan of such a species.

For what then seemed fairly good reasons, Sagan and others chose to assign P and n(e) each values near 1. These guesses, within an order of magnitude, don't seem to conflict with what we now know about planets.

For purposes of discussion it was assumed that congenial planets normally develop life, [f(l) = 1], that about a tenth of the planets with life evolve intelligence [f(i) = 0.1], and that about a tenth of the latter will see technological civilizations [f(c) = 0.1]. In other words, a likely planet will contribute roughly 0.01 technological races during its history.

A complete discussion of the Drake equation can be found in books and in many recent technical articles. (Some references for the interested reader are given at the end of this article.) There are reasons to believe that the equation is, in fact, short about three factors. But suffice it here to say that the best guesses, with plenty of up-and-down leeway in every parameter, led Sagan and others a decade ago to a rough estimate,

$$N = 0.01\ L$$

This meant the average lifespan of technological races would determine the number present in the galaxy at any time. If self-destruction is the common fate of "civilized" species, then there might be no more than a handful of them in the Milky Way at a given moment, separated by vast tracts of silent starscape. If, on the other hand, a reasonable fraction of races live a long time, the galaxy might be teeming with life.

Cameron, von Hoerner, Shklovskii, and Sagan all guessed at L, allowing for various ways in which a culture might end. Generally, their results suggested that the number of civilizations in the galaxy might be on the order of one million, most of them long-lived and patient species. The numbers giving rise to this estimate were a bit arbitrary, but not unreasonable.

If the planets of a million stars held sophont races, then about 0.001% of all eligible stars in the galaxy would be inhabited by thinking beings. The average distance separating these islands of technology would be on the order of several hundred light years—a gap which seemed unbridgable corporeally, but easily crossed by radio waves.

This was the state of affairs in the early '70s. With interstellar travel virtually ruled out, the accepted model depicted isolated motes of intelligence separated by sterile tracts of space.

These speculations led to CYCLOPS, OZMA, SETI, and CETI. The search for extraterrestrial life was born. The radio astronomers who slapped together borrowed time and equipment to scan the sky were hopeful, and numerous articles about their endeavors came out on the pages of magazines such as the one you hold.

We could take up several articles just talking about SETI. The early argu-

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ments over search strategy are fascinating reading. What kinds of antennae would be best suited for the job? Would extraterrestrial intelligences species (ETIS) transmit in the "water hole" frequencies? Should we transmit our own messages, or just wait and listen? If we wait, should we let our nearest neighbors get their first impressions of us from DEW-line radar and "I Love Lucy"?

Extraterrestrials might not use radio for long-range communication. If lasers carried their traffic, we might not be able to eavesdrop on interstellar conversations.

Even if we can't tap long-distance calls, though, we might still listen for leakage from a planet's commercial radio network . . . or search for a beacon . . . a signal *meant* to be picked up by new radio-using species like ourselves.

Many papers came out during the early '70s suggesting that advanced extrasolar sophonts would likely broadcast the interstellar equivalent of "Sesame Street," to help younger species (like us) pass over their initial dilemma of survival or self-destruction. The reasoning went that it would be in the older species' interest to help its younger neighbors live long enough to get a decent conversation going.

The first formal search for extraterrestrial intelligence came when Frank Drake and his associates looked at the two nearest candidates, the two sunlike stars that lie within twelve light years and are not members of multiple star systems. Drake's team found nothing but star noise coming from the K2 dwarf, epsilon Eridani. Then they turned their telescope to the star Tau Ceti.

And lo! They heard something! For a brief instant they felt a thrill, as modulated signals came down the cable, obviously of intelligent origin! But then, as the telescope settled down, the "signal" faded away, never to return. They soon concluded that the signal was indeed coded noise from the nearest civilization—some commercial traffic in nearby Milford, Massachussetts!

Undaunted, Drake and others expanded the search. The telescopes turned and scanned. Nothing was found. The Russians joined the search, enthusiastically. They reported only negative results.

No problem, astronomers suggested. Any advanced species wouldn't waste energy broadcasting over the entire bandwidth of, say, the hydrogen 21-centimeter line. To conserve power, and to attain a high signal-to-noise ratio, they would modulate over a very narrow band. Just wait, they suggested, until we can develop fineband simultaneous multichannel analyzers!

Yet the second and third generations of eavesdropping devices have come up with nothing.

True, still better instruments are planned. The money and time spent in the search has been insignificant compared with the potential rewards, which might include clues to the very survival of the human race. (There is a battle underway as this is being written, to restore the piddling $2-million appro-

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priation for SETI, which recently was proxmired to death.)

Still, just one decade ago some of the radio-xenologists were talking as if they expected to be cracking codes in short order!

Now a few even glumly propose that no one is "out there" after all . . . at least not in our vicinity.

How can this be? If we've been at the search for less than fifteen years, using spare time and borrowed equipment, how could anyone expect success so soon? Sure, it'd be nice to find neighbors twelve or twenty light years away; you could hold a "conversation" within one person's lifespan, for example. But, according to most calculations using the Drake Formula, the average distance between technological civilizations might be a few hundred light years. There are well over a million stars in a sphere a hundred parsecs across. It would take some time to search even the most likely of these, choosing only those radio bands we guess to be the best (not knowing whether our idea of "best" is universal.)

Two hundred light years makes "conversation" a little more difficult. But a "Sesame Street" beacon would be just as useful as ever, at that range. Just knowing extraterrestrials *existed* might profoundly boost *Homo sap*'s sagging morale.

It seems like we are presenting an argument to restore that appropriation from Congress, not laying out a case for doom and gloom. It only appears to be a matter of time and effort. Success, in the long run, seems assured to the persistent.

What has changed then? What has caused this spreading anxiety?

It's not the sort of thing one would expect to be a cause for pessimism. At first hearing it sounds like very good news.

Starships are possible—

The Third Era of Xenology

The Third Xenological Revolution began sometime in the mid-'70s, when several prominent scientists challenged the conventional wisdom that intelligent life arises upon isolated islands, forever separated by the wide gulfs of interstellar space. Sanger, Bracewell, Forward, Bussard, and others demonstrated that it's possible to build spaceships to cross the emptiness between the stars. No "magic" is needed. It isn't necessary to repudiate Einstein. Whether by light sail or by anti-matter rocket, humanity may be launching starships within a few centuries.

These "starships" would be nothing like the good old *Enterprise*. Limited to possibly a tenth of the speed of light, they could not travel terribly far by interstellar standards. But clearly they could carry people, possibly living several generations in transit. The "slow-boat" generation-ship of science fiction fame has been mathematically vindicated.

This is bad news?

Of course not. But the possibility of starships places a new and awesome burden on xenology. It presents us with a paradox that is very difficult to overcome.

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What would WE do if we had starships? If both history and literature tell us anything, we would look around for nice real estate and start colonizing. In fact, we wouldn't even need to find nice planets; stable stars with asteroid belts would do. Our own "belters" might by then prefer such virgin territory to "dirty planets," anyway.

Once the new colonies reached a high level of industry, say in a few hundred years or so, what would they do? Why, they'd send out more colony ships, of course. It seems obvious to almost anyone holding a magazine like this one.

Imagine a sphere of human settlement slowly expanding through space. How long would it take for colonies to be planted 300 light years from Earth? Even limiting ship speed to a tenth of the speed of light, and allowing each colony plenty of time to industrialize? Ten thousand years? Thirty thousand years?

Mankind has hardly changed at all, physically, in the last thirty thousand years. If we make a few social advances and avoid self-destruction, we should be able to fulfill the above scenario.

And why shouldn't anyone else? If this sort of expansion can occur once, why not for each of the million sophont races we calculated earlier? In well under 100,000 years the 200 light-year "average spacing" between races would be filled up!

Recent calculations by Eric Jones of Los Alamos Laboratories indicate that the scenario we have just described, of a slowly expanding sphere of settled solar systems, could fill the entire galaxy within sixty million years. It's not unreasonable to imagine at least one out of a million civilized races living that long. So why do we see no signs that the Earth has been colonized in the last sixty million years?

Why have we picked up no radio signals, when the stars should be humming with information and commerce?

Where are they?

This question marks the first traumatic awakening of the new science of xenology. It marks the end of a very short period of innocence. Starting around 1975 and building toward the present, the Third Xenological Revolution commenced. The dust has not yet settled, but one thing is clear. Some of our assumptions are wrong. The universe might turn out to be considerably more complicated than the scientist optimists of the late '60s at first thought.

Of course, science fiction writers and readers could have told them that all along.

The Great Silence

The Third Revolution in Xenology came with the realization that space *should* be filled with intelligent life. There appears to be no excuse any longer for the failure of SETI.

Indeed, why hasn't the Earth itself been colonized! The question, "Where are they?" might better be put, "Why aren't they HERE?" The quandary can be called the "Mystery of the Great Silence."

We see no evidence for ancient alien cities in the Earth's crust. Venus and

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Mars apparently never were terraformed, though many now think we could tackle the job in a few centuries. The asteroids of the solar system appear to be untouched.

Most significantly, the Earth, until less than a billion years ago, was populated for two billion years by only primitive prokaryotic organisms. A visiting starship need not have landed colonists. All they'd have had to do is be careless with their garbage or latrine, and the history of the Earth would be totally different.

It certainly looks as though we've been alone a very long time.

There have been several imaginative suggestions to explain the Great Silence. At the end of this article we'll compile a partial list.

Dr. Eric Jones, Dr. Frank Tipler, and Dr. Michael Hart all think it means that the earlier calculations of the probabilities of intelligent life were greatly overoptimistic. They suggest that the apparent absence of ETIS simply means that this part of the galaxy is uninhabited . . . that no race has got out there ahead of us to make an impact by colonization. Their "Uniqueness Hypothesis" implies that some or all of the factors [that] even in the Drake equation are really very small. For instance, some contend that intelligence such as ours is an evolutionary fluke.

Dr. Thomas Kuiper of JPL has presented strong arguments in refutation, showing that convergent evolution has happened frequently on Earth and might well occur elsewhere.

Dr. John Ball has dredged up the science fictional idea that the Earth is a "zoo" or wildlife preserve, and that extraterrestrials are already here, observing us. There are many variants to this concept, including "quarantine" (ETIS awaiting humanity's social maturity), a non-interference "Prime Directive," and many others. All imply we should add to the Drake equation a factor to account for ETIS purposely avoiding contact.

Contact optimists, such as William Newman of Princeton and Carl Sagan of Cornell, have tried to make excuses for the extraterrestrials. In a recent paper Newman and Sagan suggested that truly advanced cultures would practice zero population growth and thus feel less pressure to expand into virgin territory. The rate of "galaxy-filling" calculated under their extremely conservative assumptions is slow enough to make it barely possible that the nearest expanding space-faring race simply has not reached us yet.

Sagan and Newman further propose that techniques of life extension — immortality—would make individuals of a race very conservative. If a passion for risk-avoidance took hold, a species' rate of expansion, "V," could drop to nil.

Might a race naturally graduate to other interests after a certain amount of time? Science fiction is filled with possibilities, from extra dimensions to realms of the mind far more attractive than drifting through space and clearing land on some new world. Such "maturity stages" would affect "L" in the Drake equation, as well as the velocity of expansion.

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Our assumptions for f(1) might be too high. Although the precursors of life—sugars, amino acids, nucleic acids—seem likely to be about as common as stardust, it's possible that the next steps to life might be much, much harder to reach, requiring some rare catalyst to set the process off.

From physics and SF comes the dreadful idea of "deadly probes." Saberhagen's "Berserkers" might make life rare if some technological civilization accidentally let loose something so monstrous. Gregory Benford's variant on the idea is hardly more optimistic. A particularly paranoid advanced species might not want any potential competition to rise up elsewhere. Self-replicating autonomous probes might be sent out to reproduce and fill the galaxy. Whenever new radio traffic indicates that new sentients are loose, these pre-programmed probes would home in on the signals with powerful bombs and stop the infection before it spreads.

It's already too late to call back the spherical wave of "I Love Lucy," etc., that's already spreading though nearby space.

All of the hypotheses given above have their problems. Some seem to contradict the best knowledge we have in the field. Others, like the "zoo" theory, are almost innately untestable.

What we hope to do in this series is compile a list of these possibilities, with the aid of the readers of this magazine. Ideas which *do not conflict* with known facts about the universe will be welcome. When the list of possibilities is published, we will acknowledge those ideas which are original and seem to have merit.

A reading list will be provided at the end of this installment, in order to assist those serious about finding out more about the subject.

I will start things off by talking about a few hypotheses that the xenologist speculators have mostly passed up. Some are a bit frightening.

The Fate of "Nursery Worlds"

In the Drake Formula the combined factor f(i,c)—the fraction of life-planets on which intelligence and technology eventually evolve—is generally assigned a value of about one in 100. The xenologists who put forward the "one-percent" argument support it by citing the apparent fact that it took four billion years for the Earth to give rise to merely one technological race. This is almost half of the viable lifespan of the planet. Intelligent life would seem to be a rare and wonderful thing.

But is this assumption tenable? It appears to be the weakest link in the chain of logic.

Let's consider the life cycle of a "Nursery World," a planet with a stable biosphere in which the slow evolution to intelligence can take place.

Evolution appears to have proceeded gradually at first and then at an accelerating pace for over three billion years. Except for (maybe) the introduction of sex, and later of flowering plants, there is no evidence in the fossil record to support the idea that the Earth was ever suddenly invaded by extraterrestrials who, "with kith and kine," introduced

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advanced flora and fauna. The Great Silence seems, at first glance, to have stretched through the entire Paleozoic.

If we assume the Earth lay untampered with until at least the time of the Jurassic, we can guess that it takes about three billion years for life on a Nursery World to evolve to a level of complexity that makes intelligence feasible.

What if humanity suddenly vanished? Would it take another three billion years for intelligence once again to arise on Earth? If so, it's reasonable to accept the guess that the number of technological species to erupt per habitable planet is of order less than one.

But *Homo sapiens* is not the only species to have benefitted from three billion years of evolution. Today's German cockroach may look a lot like his distant ancestors, but he has accumulated many little tricks his cousins in the Triassic never heard of. The size of genome of the raccoon and wolf is hardly smaller than that of man.

Consider what's happened since the Cretaceous-Tertiary Catastrophe approximately sixty-five million years ago—the disaster which wiped out, over a period of a few hundred thousand years, almost every species of land animal whose adults massed more than forty kilos.

The creatures whose descendants went on to dominate the planet were small mammals, the early equivalents of mice, lemurs, and tree shrews. These humble animals expanded and diversified to fill all of the ecological niches left vacant by the demise of the large reptiles. We are among their descendants.

In spite of the present arms race, man still lacks the ability to exterminate mice, although he will probably soon be able to do an efficient job on himself. The sudden demise of this star system's current technological race would not finish off the Earth as a nursery. If "mice" did it once, they could probably do it again.

We are led to suggest that suitable worlds must pass through long initial "fallow" periods before attaining a level of biological sophistication ripe for intelligence. Afterwards (as proposed by John Gribbin in the December 7, 1981 *Analog*) such planets should be able to produce sophont species at fairly short intervals, *depending upon the time needed to recover from the damage done by the previous sentient race.*

The interval between the Cretaceous Catastrophe and the present is a reasonable estimate for the time it takes to build a civilized race, once small and sturdy creatures have reached a high level of sophistication.

Colonization Eco-disasters

Let's go back to that expanding space-faring species we were talking about earlier. Remember, calculations show that it might take as little as sixty million years for such a race to fill the galaxy. A question seldom asked by science fiction authors who write about colonization is, "What happens to the colonized planets?"

Unless the settlers leave large parts of their worlds fallow in wilderness preserves, or engage in "Uplift" bio-engineering of local higher animals, their

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mere presence is likely to prevent the appearance of local sentient species. The cycle of production of intelligent species on a planet is probably delayed indefinitely by an active technological settlement. A world is not likely to serve as a useful nursery of intelligence so long as it is occupied by a spacefaring race.

When the tenants finally do vacate (or die off), the recovery time required before another generation of tool-users evolves will depend on the way the settlers treated their adopted world. The more savage the exploitation of a colony planet, the more severe will be the thinning of the local biosphere. Our own technological civilization has markedly simplified ecological networks on Earth even where efforts have been made to preserve wilderness. In general, higher life forms, more delicate and dependent upon complex environments than smaller creatures, go first.

When settlers finally do step aside—by attrition, disaster, exodus, or whatever—ecological recycling can resume, but recovery and regeneration of intelligence will take much more time, the longer a technological race occupied the planet.

Expansion Shells

It is generally assumed that a spacefaring race will expand into the galaxy either because of raw curiosity or population pressure. Either way, it's clear that the expansion soon becomes sphere-like, with only the most recently settled worlds having much opportunity to seek new planets. For a race limited to slow-boat technology, colonization will take place only in a thin shell surrounding an older, settled region within.

If population pressure is the primary motive for expansion, we have to wonder at the fate of the long-occupied worlds in the interior of the settled sphere, especially those near Home planet. The words "population pressure" themselves suggest the likely fate of these worlds.

Consider the settlement of Polynesia from roughly 1500 B.C. to about 800 A.D. The island-hopping analogy with interstellar exploration and colonization is apt up to a point. Jones borrowed growth and emigration rates for his model of interstellar settlement from Polynesian history. The intrepid Polynesian example is used as testimony to the likely success and viability of "star-hopping" colonization ventures.

Polynesia may, indeed, be representative of interstellar settlement, but not in a pleasant sense. The Hollywood image of island life is paradisical, but Polynesian cultures were subject to regular cycles of extreme overpopulation controlled by bloody culling of the adult male population, in war or ritual. There are many stories of islands whose men were almost wiped out: sometimes by internal strife, sometimes by invading males from other islands far away.

Meanwhile, introduction of domestic animals disrupted island ecosystems. Many native species were wiped out.

The most severe example is the island of Rapa Nui, also called Isla de Pasqua, or Easter Island. Isolated thousands of miles from its nearest neighbors, it was

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as much like an interstellar colony as any place in human history, when it was settled around 800 A.D. Mankind may devoutly hope to do better when finally embarked to the stars.

The Pasquans utterly destroyed the virgin ecosystem of Rapa Nui in a few generations, ravaging the forest until only banana trees were left. When no wood remained for houses or boats, they had to abandon the sea and its resources, along with all possibility of escape or trade. What remained was native rock—which they carved into hauntingly desolate images—and warfare.

When Europeans arrived, the natives of Rapa Nui had just about destroyed themselves.

Assume a settled sphere of expansion by an extraterrestrial intelligent species. What of the inner systems, *within* the sphere? The Polynesian example suggests a dismal image of increasing competition for dwindling resources with no escape valve for excess population, since all surrounding systems are in similar straits.

What happens to these inner worlds? They probably don't go looking to conquer their neighbors. Interstellar warfare seems to be a frightfully expensive proposition. Conflict arising from population pressure is far more likely to be local, consisting of struggles for resources within each planetary system.

In an old settled system all available asteroids would long have been turned into habitats. Safe inner orbits with unhindered access to solar power would be at a premium.

Even the most efficient space structures will require frequent replenishment of volatile substances—gases such as oxygen, hydrogen, and nitrogen. Comets might supply part of this need, but terrestroid planets would be closer and rich in the desired light elements.

One might expect to see a profound cultural split between those living on planetary surfaces and those in space. Competition and misunderstandings might tempt the space dwellers to take advantage of their superior position to dominate their planet-bound cousins. It would be simple to bombard the cities on a planet's surface with redirected asteroids, until civilization there was obliterated. Factor L clearly falls in such a case.

(The space-born, long divorced from any attachment to planetary life, might even see a terrestroid planet as a likely source of building materials! It wouldn't be beyond their ability to pulverize a world such as the Earth by arranging planetary collisions. This would certainly affect not only L, but also n(e), the number of *planets* on which life can evolve!)

In any event, the innocent higher animals suffer in the crossfire.

ANOTHER Explanation for the Cretaceous Catastrophe

Let's return briefly to the episode about sixty-five million years ago known as the Cretaceous-Tertiary Catastrophe. There were, at that time, many advanced species of reptiles. The best candidate amongst these for a species possibly ripe for development toward tool-using might have been *Saurorni-*

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thoides, a mid-sized bipedal carnivore with the highest brain-to-body mass ratio of any reptile, approximately matching that of modern baboons. While there is no reason to think that this creature was particularly intelligent, he filled an ecologial niche that might have been rigorous enough to encourage his glimmering abilities.

But *Saurornithoides* died out along with virtually all of the other great reptiles during a relatively brief period by geological standards.

If the demise of the dinosaurs puzzles paleontologists, the problem has been even worse for the marine biologists. The dinosaurs, at least, took as long as a few million years to die out. The tiny sea microorganisms experienced a greater catastrophe. Over half of the species of phytoplankton went extinct within about one year!

The latter mystery, at least, now appears solved. Recent deep-core drillings have uncovered thin layers of clay rich in exotic elements, including iridium (up to 25x normal abundance of some isotopes), at sedimentary levels associated with the end of the Cretaceous. Discoveries in locations as diverse as Italy and New Mexico all seem to correlate a sudden invasion of strange dust with the equally sudden disappearance of many classes of oceanic microorganisms. Scientists now conclude that a major meteorite impact kicked up a great pall of dust which severely altered weather patterns, resulting in mass extinction by starvation when photosynthesis was interrupted.

(The meteorite explanation of the Cretaceous Catastrophe was also discussed by John Gribbin in the December 7, 1981 issue of *Analog*.)

For the marine creatures this seems sufficient, but don't forget the dinosaurs were *already* dying out before this bombardment, starting with the greatest behemoths and so on down to the smaller herd animals. Their die-back was a lot like what we see happening today to the wild animals of Africa at the hands of white and black "intelligent" beings. The meteorite seems to have been only one of the last straws for the great reptiles.

Might the demise of the dinosaurs, then, be part of a hidden pattern? Is it possible that an alien colony began a process of extinction that was by the meteorite (or meteorites) only finished?

A natural planetfall can't be distinguished from one targeted against ground settlements of a technological species. Is it possible that the dinosaurs were innocent bystanders in a genocidal war amongst alien settlers in the solar system?

The bombardment might only have been the last act in a more gradual ecological catastrophe that began half a million years before, when settlement of the planet resulted in extinction of species after species.

The introduction, about this time, of flowering plants, is another environmental perturbation that had profound ecological effects. It's not absurd to imagine this fitting into an overall pattern of outside intervention.

The settlement of Earth by a spacefaring race about seventy million years

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ago, then, offers one more (admittedly tenuous) explanation for the destruction of the higher terrestrial life forms over a brief period.

If we make this hypothesis, however, where are the traces of this earlier technological occupancy? Over sixty million years of oxidation will destroy many artifacts, but certainly some might survive.

Who can say? The cities we look for may lie beneath astroblemes. A look at a geological map of the Earth shows that continental plate boundaries have proved to be choice living sites. These plate-edge regions have suffered pronounced geological changes that could have erased most traces of alien settlement.

The final test of this hypothesis would be found among the planetoids of the solar system. The asteroids might hold remnants of visits to our star by extraterrestrials . . . perhaps whole cities, the leftovers of great populations: killed off, perhaps, by biological warfare in desperate retaliation by the Earthbound cousins they had annihilated.

Cycles of Recovery and Expansion

This hypothetical explanation for the Cretaceous Mystery merely should take its place in a catalogue of possibilities, perhaps near the bottom. Still, it's interesting to note that the period since that catastrophe—an interval which culminated in the development of *Homo sapiens*—is the same sixty million years suggested by Jones and others for an optimum minimal galaxy-filling time by a technological race.

The Cretaceous-Tertiary event was not the only one of its kind. At least four other mass extinctions are found in the sedimentary record, including one at the end of the Devonian and another at the Permian-Triassic boundary, approximately 225 million years ago. These events are less well understood and may have taken place over longer periods than that of the Cretaceous, but we may compare the rough 10- to 500-million-year intervals seen with those suggested by Newman and Sagan for Galaxy filling by space-travelling species.

If the ecological holocaust of the Cretaceous was a local manifestation of the death spasm of a prior spacefaring race, whose overpopulated sphere of settlement spoiled and self-destructed as the shell of colonization passed outward, then we humans may have come into being almost too late. Any longer, and the next wave—the expanding shell of still another spreading technological race—might have washed over Earth before we had the ability to assert property rights . . . assuming we have that ability now.

We may wonder if the Earth is the first Nursery World to have recovered sufficiently, since the last wave of "civilization" passed this way, to develop a species with intelligence. Whether or not the end of the Cretaceous corresponded to the agony of dying starfarers, it may well be that colonizing cultures inevitably leave behind them wastelands empty of intelligence and living voices.

If we humans initiate an era of interstellar travel of our own, we may find

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all around us the blasted remains of an earlier epoch. Would we then learn a lesson? Perhaps. But with the ever-present opportunities for expansion, those humans who exercise self-restraint and environmental sensitivity toward their adopted worlds will not be able to force this tradition upon those who travel far away to establish newer colonies. A nucleus of selfishness is likely to expand more rapidly than a center of more rational colonization. While there may be zones where settlers preserve and protect the local ecospheres, cognizant of their long-range potential, others may be rapacious.

Certainly our environmental record here on Earth is a test. The list of extinct species, some of which might one day have become starfarers, is long and growing longer.

The Great Silence may be the sound of sands drifting up against monuments. It may be quiet testament to the fate of species which allow "population pressure" to be their motivation for the stars.

More Ideas

We'll begin a "morphological" analysis of the Great Silence by presenting the following list of possibilities:

1) SOLITUDE. We are unique in evolving technological intelligence.

This hypothesis implies something is very wrong with current use of the Drake Formula. Habitable planets may be rare, or some "spark" may be needed to initiate life out of a pre-biotic soup.

The final step to intelligence may require some software miracle that makes it far more improbable than currently thought.

Alternatively, the last term in the Drake equation—the average lifespan of technological species—may be on the order of decades. This might be due to some "inevitability" of self-destruction, or due to the "Deadly Probes" of Saberhagen and Benford.

2) "MAGICAL" TECHNOLOGY.

It may be that technological species soon discover techniques that make radio and even colonization irrelevant. We may be on the verge of such discoveries right now, though it's hard to imagine any race totally abandoning the electromagnetic spectrum, whatever its other options.

3) "QUARANTINE"—The hypothesis of purposeful avoidance of contact.

This is an idea long popular in science fiction. It explains the Great Silence by suggesting that the solar system is kept as a "zoo." Or benevolent species might want to let Nursery Worlds lie fallow for long periods, to nurture new sentience.

Related ideas are that observers are awaiting mankind's social maturity or have quarantined us as dangerous, perhaps infected.

Kuiper and Morris also have suggested that members of a galactic radio club would not contact "beginners" because this would wreck our usefulness as members of the network. Making us information consumers too early would spoil us as information *providers*, whose unique experience would add richness to galactic culture.

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ETIS may visit the Solar System for reasons having nothing to do with us.

A problem with "QUARANTINE" is the galaxy's differential rotation. Our neighbors don't remain our neighbors. If during one epoch we live near environmentalists, ten million years later our sun could enter the domain of a less scrupulous race. The QUARANTINE hypothesis appears to call for some degree of cultural uniformity in the galaxy . . . hard to accomplish in a relativistic universe.

4) MACROLIFE—The abandonment of planet-dwelling as a lifestyle.

Expansion will generally come from those colony worlds most recently settled. There might be a great selective process favoring those individuals suited to living in starships. One can imagine the pioneers eventually deciding that planet-bound existence is filthy and degrading. This might result in either of two different behaviors, each compatible with the Great Silence. Truly spaceborne sophonts might greedily fragment terrestroid planets for building material and volatiles, leading to disastrous versions of "SOLITUDE" or "LOW RENT" (see below), or they might cherish Nursery Worlds for what they are and protect them as in option "QUARANTINE," without any conflict of interest or desire to use high-gravity real estate.

5) "SENIORS ONLY"—More alternate lifestyles.

It's often suggested that spacefaring sophonts might "graduate" to other interests after a reasonable time. This would set a limit to the period of expansion, though not, perhaps, to exploration.

Discovery of immortality could tend to promote conservatism, and an aversion to the dangers of spaceflight.

6) "LOW RENT"—Earth is Inaccessible or Undesirable.

Spacefaring sophonts that otherwise had the means might choose to bypass Earth. A few possibilities to consider are the following.

a) The one technique for travel faster than light (FTL) which has drawn some support from the physics community has been "geometrodynamic"—via controlled entry into the zone of influence of a Black Hole and traversing spacetime through hyperdimensional shortcuts. If such a version of FTL travel were possible, convenient, and efficient, one might expect galactic civilization to cluster around entry and exit points. Long-range slowboat technology would languish.

The fact, then, that astronomers have observed no nearby black holes may be a manifestation of the so-called Anthropic Principle. If a "usable" black hole were closer the Earth would have already been settled, an ecological holocaust would have ensued, and we would not exist to observe the black hole. Thus the fact that we are here is consistent with a failure to observe nearby black holes.

b) Another systematic effect that might make for periods of inaccessibility is the migration of the sun around the center of the galaxy. We are currently on our way out of a gas-and-dust-rich spiral arm. In a few million years

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the sun will be in an "open" area, where there are few bright, younger stars. Spiral arms are home to the dense interstellar hydrogen clouds. These are thought required to run Bussard ramscoops, but today that particular type of vehicle is falling into some disrepute. Besides, the clouds might also be hazards to other forms of travel.

c) Earth life forms rely almost totally on the left-handed isomers of complex organic proteins and amino acids. This might not be the case elsewhere. Should "dextro-" life dominate everywhere else we might find Earth systematically avoided because there would be nothing here for prospective settlers to eat!

These are just a few examples of an endless supply.

7) MIGRATION HOLOCAUST.

This category has received the most attention in this article. Transient occupation of a Nursery World by a techno-culture might cause extinction of local higher life forms, delaying the local upsurge of intelligence and resulting in a neighborhood so depleted that we are the first to recover in the nearby area.

Conclusion

The quandary of the Great Silence gives the infant study of xenology its first traumatic struggle: between those who seek optimistic excuses for the apparent absence of sentient neighbors and those who enthusiastically accept the silence as evidence for humanity's isolation in an open frontier.

As humanity grows up, we're finding out just how complicated the universe can be. We've seen that "Galactic Empires" have implications far beyond anything considered even by the science fiction of the past. The universe has many more ways to be nasty, if it so chooses, than we had thought.

Opportunities do not, however, have to be taken up. While the author doesn't accept that elder species will necessarily be wiser and more restrained than contemporary humanity, he does suggest, and hope, that such noble races DO crop up from time to time. If such a culture lived long, and retained much of the strength and vigor of youth, it might have taught a tradition of respect for the hidden potential of Life to all subsequent spacefaring species.

It might turn out that the Great Silence we're experiencing is like that of a child's nursery, wherein adults speak softly, lest they disturb the infant's extravagant and colorful time of dreaming. ■

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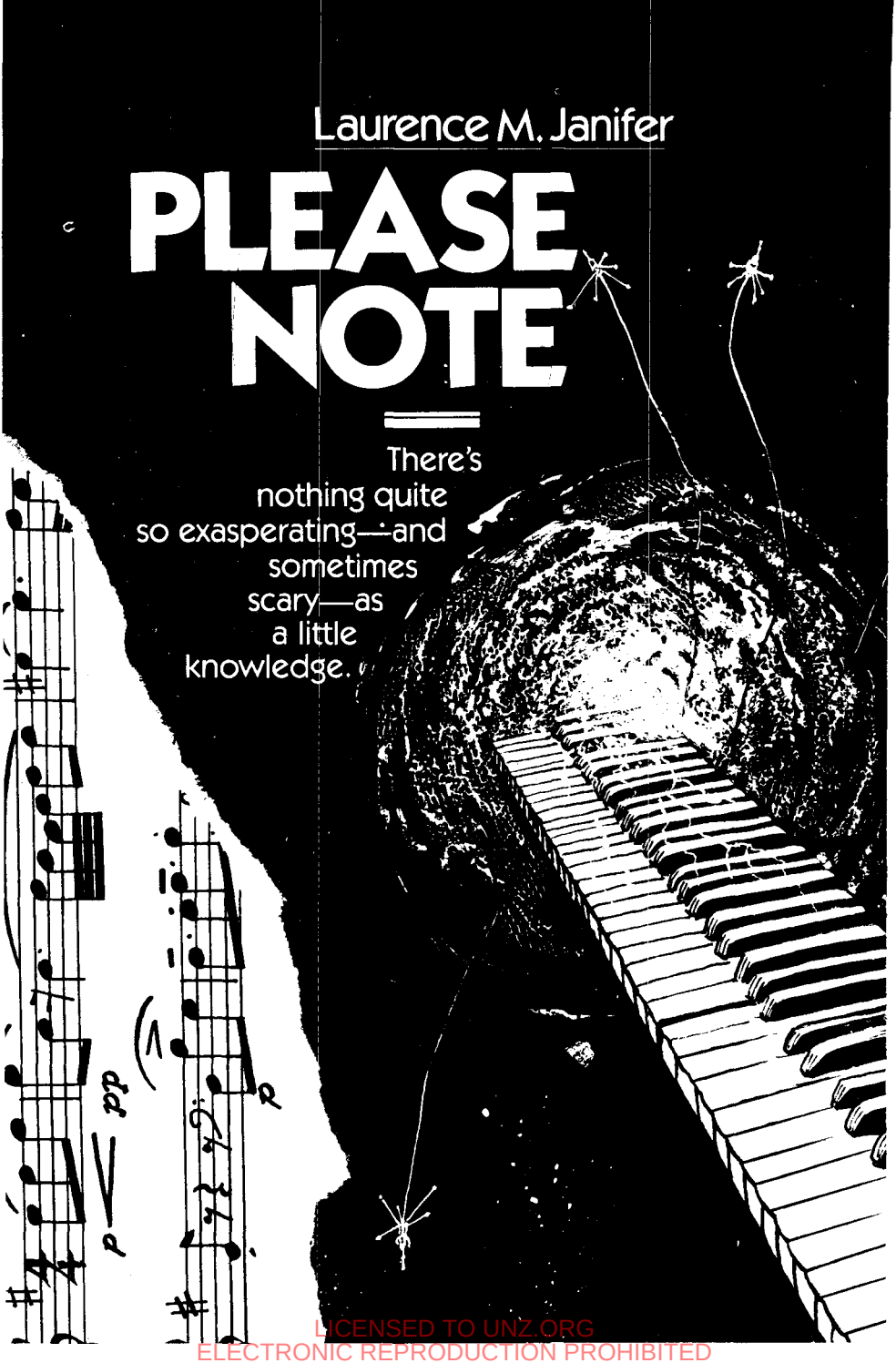
Laurence M. Janifer

PLEASE NOTE

There's nothing quite so exasperating—and sometimes scary—as a little knowledge.



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My life hasn't been the same since Danny Karodny banged on my door one night around ten, both his jacket pockets stuffed with rolls of composition paper and his oboe stuck in his belt, and started talking about Charles Fort. Talking damn loud, too, and it took enough time to get him down to a good decibel level so Maria came stumbling out of the bedroom—she's a day person, but we get along—and went into her solo about waking the kids, which runs better than six minutes uncut. About half the time it wakes the kids, but there is no sense trying to explain that to Maria any more than there would be to any other wife in the world.

She doesn't like Danny any great hell of a lot anyhow, because Danny is a sort of relic of my past life, before I became respectable. I think *respectable* means you worry about waking the kids. You're not respectable, what the hell, you let them stay up and watch. Right?

Charles Fort, he kept saying, and alien beings, and the end of the world, and none of this was blending very well with Maria. She didn't cut her solo any, and Danny didn't stop talking, so she kept flashing me these little looks she does. Stoned, high, wiped out on something totally weird; these cracked composer friends of yours; and what do we need with people like this now you're a steady orchestra seat, paycheck every week, why not some nice people for a change, Marty? and if you think I'm going to put up with this freaky drugged-out nonsense any longer; and so forth. Maria has never got the drug scene straight: Danny would sooner take cyanide than a small puff of the weed, let alone anything else, since the first thing

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to go is the time-sense, and a serious composer (Danny says) has enough trouble as it is.

But I had to admit he was acting a little strange. Not exactly the happy, nervous, ragged optimist of old, you might say. What I did, I sat out Maria's aria, and gave her to understand that I felt for her deeply and it would hardly ever happen again, and I knew how the kids needed their sleep, and also Maria. And after she had retreated to the bedroom I said: "Alien beings?"

Danny was pacing around the kitchen, which meant I had to sit in the corner chair and watch him. It's a small apartment, but any musician learns to take what he can get, there being a lot of people who object to practice scales. "Alien beings," he told me. "It's all in Charles Fort. I mean, years ago. He wrote it all down, Marty, and we laughed at him. We wrote him off as a nut, and we sneered at him."

"The hell I did," I said. "Who is he?"

Fort (maybe you know this already?) was a guy who spent his life collecting weird facts: stuff about people turning into swans, rains of frogs, disappearing ladies, God knows what. He wrote all these stories down in four books, and someplace in one of the books he said there was an alien race Out There, watching us, and they owned us. We were property, was his thing, and maybe we were lab specimens or something. As if the whole planet Earth, say, was a setup, the way scientists take some rats or flies and build an environment for them, and work things out a while.

Which could be good enough for Charles Fort, maybe, but not for the Danny Karodny I had known since Curtis Institute. He looked ragged and patchy, more than usual, and his eyes were damn wild, and he kept up this back-and-forth and flinging his arms around, and his hair was standing out about seven inches from his head all over and his beard was uncombed, which was *really* strange. Most of all, he *sounded* different. It was not anywhere clear what the hell had got into him.

I thought he had picked up on this book and, being maybe in a sensitive state, he had been hit a little too hard. So I said, in a very peaceful tone: "Just because it's written down, that doesn't mean it has to be true. There are a lot of far-out things—"

"I didn't read it somewhere," Danny said. There was a kind of desperation in his voice, like a block that kept him above A-sharp. "I mean, that isn't why I know this. I know it. That's all. It's the only thing that fits."

I said: "All right, calm down and give me *all* the pieces," and I broke out a beer, and Danny got to sitting down across the small table and took in some reheated coffee, which told me he was still serious about his time-sense and therefore not even remotely in some novel chemical state: alcohol shakes up the time-sense, too, just a little, and I have heard Danny do a solo on that (nine minutes even) almost as often as I have heard about waking the kids. "Let's see how the pieces fit," I said, and Danny, now he was sitting down and with a little bad coffee inside him, seemed to calm down. Not too damned much. But he nodded.

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"You know about the *Thespis*?" he asked me.

Naturally I knew about the *Thespis*. Danny is by no means the Abominable Bernstein, but even with the government cutting back on the arts a fair piece, he has picked up a commission here and there, and *Thespis* was due to be performed in Namibia as part of a cultural-exchange deal in eighteen months, provided Danny could work his way through a couple of interesting technical snarls and finish the thing. And provided Namibia could scratch up some culture to exchange, I suppose? At any rate, the technical snarls were what had got him in an especially sensitive state, and he'd hit the point where he had started to explain exactly how he was solving them, which is the surest indicator I know that work is at a standstill. There was something about the fluidity of rigid structures, which might even have meant something if it hadn't been talk. "What about it?" I said. "Into Part II yet?"

"Vaguely," he said. "Vaguely. I have all of Part III blocked out, so all I have to do is work my way backward into the formal structure. You see, the whole trouble was the two consistent chains—" He shut up and drank some coffee. "Never mind about that," he said, surprising me slightly. "But try this on for size: the other day a man from the State Department came to see me."

"Breaks up your day," I said, "but it's a government commission; I suppose he wanted to inspect for finished pages?"

"This is no joke," Danny said, all the way down to F-below, and I looked apologetic. "He offered me a bonus on the commission money, an extra $5,000, if I would just do 'one simple little thing'." I could hear the bland A-flat-major official voice making that proposition, and I prepared for the worst.

"What simple little thing?" I said.

"Twenty-five bars," Danny said, "in the middle of Part II, a solo for clarinet and prepared piano. He gave me the score. Note for note. He told me to drop it in anywhere I thought it might fit. He said it would be worth my while."

I set my beer down and stared at him. "The Secretary of State thinks he's a composer?" I said.

"That's about what I figured," Danny said, "after I kicked the man out. Then I got a letter, four days later—" Like a fair sprinkling of musicians, especially composers, Danny owns no phone — "asking me to reconsider. Very polite, very remote, but you could feel the pressure. As if the commission depended on it. I'd sent the twenty-five bars out with the delivery boy, but the letter said the stuff would be available any time. All I had to do was ask; they'd deliver again. And it didn't quite say *or else*, but it came damn close."

"So they think it's important," I said. "But—" I flung out my own arms. "It doesn't make any sense."

Danny smiled at me. It was a very tired smile; he looked the way he'd looked the day his Second Orchestral Farrago had been reviewed in the *Times* as "dull and preposterous." I sighed.

"All right, it makes sense," I said. "Show me how."

"Marty," he said, "have you ever thought of music as a code?"

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"Alfred Hitchcock," I said at once. "Tap-dancing the secret spy stuff—years and years ago, that was. Late, Late Show stuff. My God, Danny, do you mean they wanted you to put in a code message? In Namibia, at a cultural-exchange premiere?"

"Why not?" he said.

I flung out my arms again. "Why music?" I said. "I mean, sealed diplomatic pouch stuff, or electronic scramblers, or—"

"I thought about that, too," he said, with the same tired smile. "Because music is a code, all right, but it's really sort of a simple one. You can break it down to shorts and longs, like Morse—Beethoven's V-for-Victory, remember?—or you can treat it as a succession of letters—A-D-E-F-G-A-F-A or whatever—or you could work it both ways at once; but there's no way you could get it as complex as, say, a mathematical system, or the sort of thing an electronic scrambler could do."

I had to grin, for maybe a second. Trust an oboe player to fish for a musical example and come up with *Swan Lake*. "But if the idea of a code doesn't make sense—"

"It does, though," Danny said. "Under one very special condition. You can't crack a code if you don't know it is a code."

I thought about that for a minute. Sure: all the expectable stuff would be watched. But a musical performance? Who'd think of that, except Alfred Hitchcock for an old movie?

I drank some beer, thinking damn bitter thoughts. Government interest in the arts. There had to be a reason it hadn't been cut back to zero. And what better reason could there be, for a damn government? "Don't bother about the music making sense," I said, "just use it as a cover for a lousy code operation."

Danny nodded. "The man who pays the piper," he said.

"Calls twenty-five bars of the tune," I said, and then it hit me. "Hey—wait a minute—where do the aliens come in? And all the rest of this?"

Danny gave me the smile once more: tired, distant, ultimately certain. Then he said one word:

"Shostakovich."

It took a few weeks. Maria wasn't happy, and explaining didn't do any good because Danny Karodny was involved in it, which is how her mind works: she doesn't like him, so the hell with it.

But for once I let her go through her whole unhappiness repertoire, from The most promising contralto at Juilliard to My mother warned me about you. I was too busy to spend time on my own counter-repertoire (The most promising loused up the only four chorus jobs she ever had, and Your mother warned you about everybody, why should I be different?, among other selections); for one thing, I had to hunt up a cryptanalyst, which is sort of a rare bird.

I found him, though, with Danny's help. His commissions had given him maybe five numbers to call among official-type people, and one of the numbers turned out to be a helpful young lady who had a friend whose father knew of a . . . It was like that, and the first cryptanalyst we got to thought we were escapees from a buggery, or nuthatch.

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The second one was worse. Cryptanalysts, she told me, tend to have very open minds, because it goes with the territory, like fairy chess, and I knew about fairy chess, which is make-up-your-own-rules chess or thereabouts, because pit violinists on Broadway play a lot of it as well as the regular kind, having to do something to stay alive during the nineteenth month of a good run.

This cryptanalyst had an open mind. She was willing to think about the possibility of aliens on Earth passing each other messages by way of musical codes. (It isn't a true code anyway, but a cipher. A true code, she says, can scarcely ever be broken without the code-book or a very fair knowledge of the sort of messages being transmitted; a cipher can always be broken, because it doesn't work on a book, it works on a simple rule, and you can find the rule by proper analysis. Alien beings, apparently, don't want to have code-books lying around. They don't seem to take a lot of chances—at any rate, not until lately.) However, she went on, and she used the word like an axe:

However: if the aliens are transmitting, they're using their own language, not ours, which would not be so simple to break without some sort of Rosetta Stone; this made sense after I had looked up Rosetta Stone in a handy encyclopaedia.

And second: how do the aliens tell code messages from accidental code-type patterns any composer might just happen to toss in?

Danny just about went into orbit. It *had* to be aliens, he kept saying, and there *had* to be a way of cracking the code. The cryptanalyst said: "Cipher," and: "How? For that matter, why?"

Why, according to Danny, was easy. Look: government support, and even control, of the arts is beginning to exist almost everywhere. Maybe even in Namibia, depending on what you mean by "government" and "arts." Shostakovich is just the most famous Russian case—forced to recant his own Fourth Symphony, for God's sake.

And government support or control really does have to have a reason. And, if it's everywhere . . .

Well, what human agency is looking for codes (sorry: ciphers) in music?

(This may not be limited to music, of course: there's always modern painting and sculpture, and some of the new writing coming out seems to make little enough sense to qualify. But I'm no judge, and I'd rather not say anything bad about any artist—or any other member of the human race.)

"Assuming that an alien cipher exists," the cryptanalyst said, very, very calmly—a lady who surprised me by looking very attractive indeed, with a *chalumeau* clarinet voice around the bottom F that kept my ears much happier than they had expected to be —"assuming that, why *must* this cipher be anything we can work with—in under four real-time computer years, I mean? Without a Rosetta Stone—"

Danny gave her a grin, sort of spastic but the first real grin I had seen on his face in some while. "Because," he said, "the aliens might be confused by accidental 'messages' some Earth composer might invent. And because — remember this, Doc—the aliens are on Earth, and there may be more than one

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kind. A sort of Equal Employment Opportunity Alien group. It'd make sense—if they're here to study us or check up or—whatever—a lot of different aliens might be interested."

"And?" the cryptanalyst said, just as calmly.

Danny grinned again. "Well, they need a common language," he said. "And they have to have ours anyhow—maybe more than one, but sure as hell they have to have English."

"And Chinese, I should think," she added. "And—but I agree: English would be the best bet. *However*—"

Danny took the remains of the axe out of her hands. "What we have to look for," he said, "is a short message that says: *This is a cipher*. It has to be very, very common; it has to appear just about everywhere, and more often than any other message. Without it, an accidental message gets ignored—right? And the chances of a human composer running into *both* messages, in the right order, are pretty damn small. Right?"

"Right," she said. This was one tough lady, it turned out. She dragged us both through weeks of work, trying to pull out a single identical message—the *This is a cipher* warning. We had a little computer help, but not much. "Cryptanalysts have open minds—or most of us do," she said. "But the people who allocate computer time can't afford to have. Ten real-time minutes will demand more than just a nice, oddball theory about aliens. And besides," she went on, with a nice smile of her own, "you two are musicians. If the single warning message is all that common, you ought to be able to find it with very little trouble."

We did, too. The pattern looks to be straight notation—no short-and-long stuff, just the notes. And the message is as common as a C chord:

C-C-D-E-C-E-D.

The form of that you probably know is *Yankee Doodle*. But the pattern seems to be universal. It shows up again and again, in Sibelius, Shostakovich (for sure!), Glinka, Delius, Bartok, Berlioz, Ives, even Beethoven—quite a list. There are appearances of it in Japanese music, too, if you call it music.

And it's still appearing—the tempos vary, of course, but those seven notes turn up everywhere you look—once you start looking.

There's a time-lag between warning and message; our pet cryptanalyst dug that fact out after wasting a lot of effort on the notes that immediately followed the warning. The time-lag is six minutes, even.

When we brought the warning in to her, she said: "Congratulations. But of course it had to be there, if your theory were to make sense." And she shook my hand, and Danny's.

I had expected something a little warmer. *However*—Maria still thinks the cryptanalyst was a little old white-haired man with a cracked voice and very thick glasses: why stir up arias?

We turned up a lot of messages, some of which do not seem to make much sense. What would you do with this one? (Act III of a Swedish opera, by the way, and so bad I still can't forget it.)

Deciphered:

experimental results satisfactory
roaches and cocker spaniels
synergistic with humanity

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external limbs of beings non-radiant

We got that one after a couple of recent Rumanian works, for God's sake, that gave the cryptanalyst enough to work with to bring out some fairly long messages and check the cipher—which does turn out to be in English, by the way. Good luck for us, I suppose. Or maybe not . . .

At any rate, the last Rumanian message, very long for a single cipher job, lets us know why the aliens aren't being quite so careful any more—working directly on Danny, for instance, via the State Department. (Danny did go back to State—and got a further request, which involved seven notes we already knew—six minutes before those twenty-five bars, which was no surprise.) And this is the one that's worrying me:

experimental run satisfactory to highest degree
command orders end of run
proper time our joint decision
to be made by heads of departments
all others on or near planet will be informed before atomic sterilization of test area
please await information and prepare to leave planet and system
sterilization of test area must be complete

Great. Wonderful.

And one more (the slow movement of a fairly dull Canadian string quartet) gives the method of information for all aliens currently living (in disguise, I suppose—some of them, anyhow) on Earth. I don't know how much time they'll be allowed to get clear, and I have no idea whether any human beings can get clear at all. But the message will be very simple. And maybe, if we show that we've figured it out, we'll be saved—for another experiment, or maybe better.

Hell. Even at the worst, damn it, I want to *know*.

And if you can think of anything at all—let's get together on this. Let me know. Right?

The message will show up on at least three radio stations, and two TV broadcasts. It will be a piano solo, ten seconds long. I have no idea of the year or month or day, except that it's going to be damned soon, but it will show up at precisely 1618 Eastern Standard Time.

So: this time, they don't need their warning message. You don't need to listen for that.

1618 is 4:18 P.M., and it sort of disrupts my life, since the kids are up and about around then, and I have to shut them up, and shut Maria up too. But I've been managing it, every day.

Check the three radio stations, or the two TV jobs, which have the highest listener rating in your area. They'll be the ones.

The message, for piano solo, goes like this:

E-F-Fsharp-G-D-C-G-Fsharp-F-E.

When you hear it—well, now you know.

It's a nice pattern, usually played sort of slow. Very symmetrical.

If you happen not to be musical, you'll still recognize it. It's *Melancholy Baby*. ■

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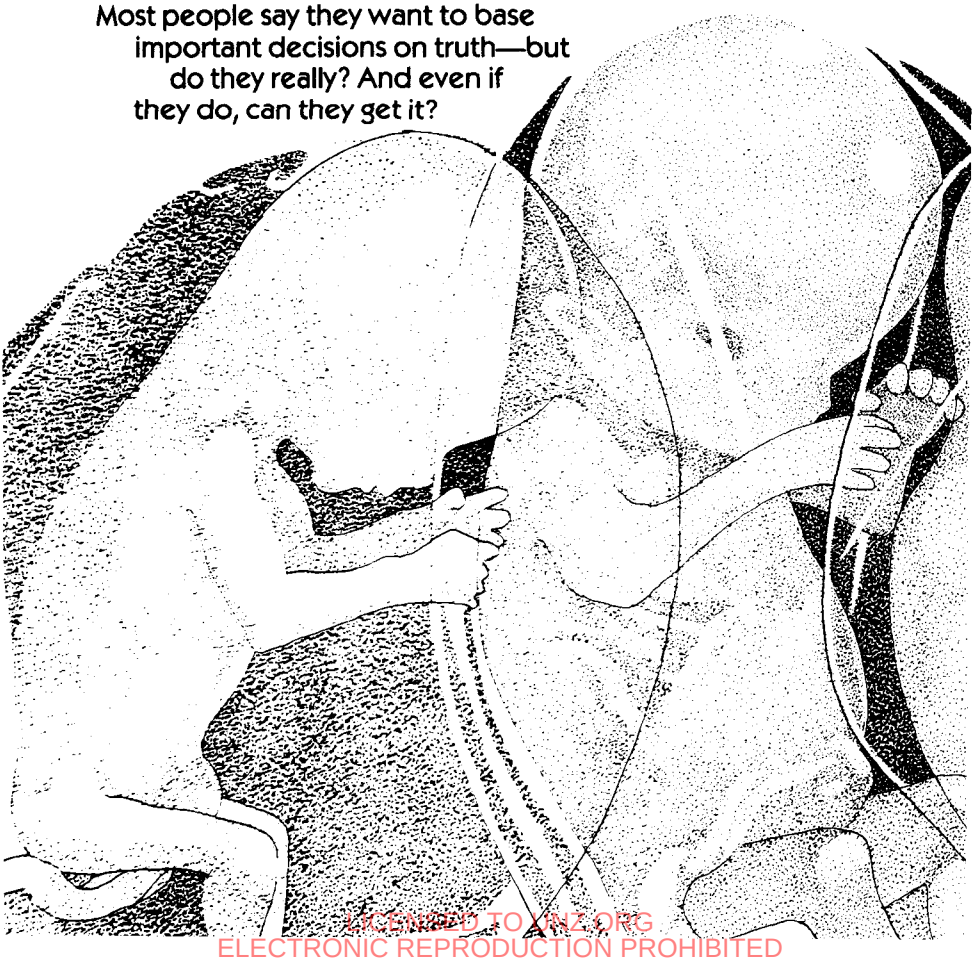
Timothy Zahn

THE FINAL REPORT ON THE LIFELINE EXPERIMENT

Most people say they want to base important decisions on truth—but do they really? And even if they do, can they get it?



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It has been less than a month now since the sealed personal files of the late Daniel Staley have been opened, but already the rumors are beginning to be heard: rumors that explosive new information concerning the Lifeline Experiment has been uncovered. Though these rumors contain a grain of truth, they are for the most part the products of prejudice and hysteria, and it is in an effort to separate the truth from the lies that I have consented to write this report. Since, too, I find that even after twenty years a great number of popular misconceptions still surround the experiment itself, I feel it is necessary for me to begin with a full recounting of those controversial events of 1994.

I suppose I should first say a word about my credentials. I became Dr. Staley's private secretary in 1989 and continued in this role full-time until his tragic death. My usefulness to him stemmed from my eidetic memory which, especially when coupled with his telepathic abilities, made me a sort of walking information retrieval system for him. It is also the reason I can claim perfect accuracy for my memories of the events and conversations I am about to describe.

The popular press usually credits Dr. Staley with coming up with the Lifeline Experiment idea on his own, but the original suggestion actually came from the Reverend Ron Brady in mid-January of 1994. Brady, a good friend of Dan's, was driving us back to San Francisco from a seminar on bioethics at USC and the conversation, almost inevitably, turned to the subject of abortion.

"You realize last week's decision makes the third time the Supreme Court's reversed itself in the last twenty years," Brady commented. "I think that must be some kind of record."

"I wasn't keeping score, myself," Dan replied, stretching his legs as far as the seat permitted. It had been a hard weekend for him, I knew; though it had been over two years at that point since the National Academy of Sciences had officially certified his telepathic ability, there were still a few die-hard skeptics around determined to prove he was a fraud. From the number of handshakes I'd seen him wince over I gathered most of the doubters must have converged on USC for the weekend, and he was only now beginning to relax.

"It's crazy." Brady shook his head. "The legality of something like that shouldn't change every time a new administration sets up shop in Washington. It makes for emotional and legal chaos all around and gives the impression that there are no absolute standards of morality at all."

Dan shrugged. "You know me, Ron. I believe in letting people do what they like in this life, on the theory that whatever they do wrong will catch up with them in the next."

Brady smiled lopsidedly. "The laissez-faire moralist. But don't we have an obligation to help our fellow men minimize the problems they'll have in the next life? That seems to me a perfectly good rationale for the inclusion of morality in law."

Dan reached a hand back over the seat toward me. "Iris: a devastating quotation to put this fellow in his place, if you please."

I made no move to take his hand. "I'm sorry, Dr. Staley," I said primly,

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"but it would be unethical for me to help you in your arguments. Especially against a man of the cloth."

He chuckled, threw me a wink, and withdrew his hand. "Seriously, though, I don't see how you can expect anything but political flip-flopping when you have an issue that's so long on emotion and so short on real scientific fact. A human fetus is alive, certainly; but so are mosquitoes and inflamed tonsils. *When* a fetus becomes a human being and entitled to society's protection is something we may never know."

"True." Brady glanced at Dan. "Maybe you ought to try contacting a fetus telepathically some day; see if *you* can figure it out."

"Sure," Dan deadpanned. "I could go in claiming to be womb service or something."

Brady came back with a pun of his own, and the conversation shifted to the topic of microcurrent therapy for certain brain disorders, where it remained for the rest of the drive. But even though Dan didn't say anything about it for four months, it is clear in retrospect that Brady's not-quite-serious comment had taken root in his imagination. Even for somebody as phlegmatic as Dan, the possibility that he could take a swing at such a persistent controversy must have been an intriguing idea, especially after the weekend he'd just gone through. Unfortunately, it also is abundantly clear that he started things in motion without any real understanding of what he was getting himself into.

It was just before five o'clock on May 23, and I was preparing to go home when Dan called me into his office. "Iris, didn't I meet a couple of professors in the Child Development Department of Cal State Hayward down at USC last January? What were their names?"

"Dr. Eliot Jordan and Dr. Pamela Halladay," I supplied promptly. "Do you want the conversation, too?"

He pursed his lips, then nodded. "I'd better. I'm pretty foggy on what they were like."

I sat down next to him and took his hand in mine. Even now there are many people who don't realize that Dan's telepathy required some form of physical contact with his subject. They envision him tapping into the secrets of government or industry from his San Mateo home. In reality a moderately thick shirt would block his reception completely.

The conversation hadn't been very long to begin with, and playing it back took only a few seconds. When I'd finished, Dan let go and frowned off into space for a moment, while I played the conversation back again for myself, wondering what he was looking for. "They both seemed pretty reasonable people to you, didn't they?" he asked, breaking into my thoughts. "Competent scientists, honest, no particular axes at the grindstone?"

"I suppose so." I shrugged. "It might help if you told me what you had in mind."

He grinned. "I'll show you. What's the phone number over there?"

I gave him the college's number, and within a few minutes he'd been routed to the proper department. "Of course I remember you, Dr. Staley," Dr. Jordan said after Dan had identified himself and mentioned their brief USC meeting. Even coming out of a tiny phone speaker

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grille, his voice sounded as full and hearty as it had in person. "It would be very hard to forget meeting such a distinguished person as yourself. What can I do for you?"

"How would you like to help me with an experiment that might possibly put the lid on the abortion debate once and for all?"

There was a long moment of silence. "That sounds very interesting," Jordan said, somewhat cautiously. "Would you care to explain?"

Dan leaned his chair back a notch and began to stroke his cheek idly with the end of his pencil. "It seems to me, Doctor, that the issue boils down to the question of when, exactly, the fetus becomes a human being. I believe that, with a little bit of practice, I might be able to telepathically follow a fetus through its entire development. With luck, I may be able to pin down that magic moment. At worst, I may be able to show that a fetus *isn't* human during the entire first month or trimester or whatever. Either way, an experiment like that should inject some new scientific facts into the issue."

"Yes," Jordan said slowly, "depending on whether your findings would be considered 'scientific' by any given group, of course." He paused. "I agree that it's at least worth some discussion. Can you come to Hayward any time this week to talk about it?"

"How about tomorrow afternoon?"

"Tomorrow's Tuesday . . . yes, my last class is over at two."

"Good. I'll see you about two, then. Good-bye."

"Good-bye."

Dan hung up the phone and looked at me. "Does that answer your question?"

It took me a moment to find my voice. "Dan, you're crazy. How exactly do you propose to read a fetus's mind without climbing into the embryonic sac with it?"

"Via the mother's nervous system, of course. There must be neural pathways through the placenta and umbilical cord I can use to reach the fetus's brain."

"With the mother blasting away and drowning out whatever the fetus may be putting out?"

"Well, yes, I suppose that might be a problem," he admitted.

"*And*, even if you do manage to touch the baby's mind, are you even going to know it?" I persisted. "This isn't going to be like the colic studies you did with Sam Sheeler, you know —those babies were at least being exposed to a normal range of stimuli. What on Earth has a fetus got to think about?"

He grinned suddenly. "I *said* it might take some practice." He stood up. "Look, there's no sense dithering over these questions now. We'll go see Jordan tomorrow and hash it all out then. Okay?"

"All right," I said. "After all, if it doesn't work out, no one will ever have to know we came up with such a crazy idea."

"That's what I like about you, Iris: your confidence in me. See you tomorrow."

We arrived on the Hayward campus at two o'clock sharp the next day—and it took only ten minutes for my hopes

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of keeping this idea under wraps to be completely destroyed.

They were waiting for us outside the door to Jordan's office: a man and woman, both dressed in conservative business suits. I recognized them from TV news shorts of the previous year, but before I could clue Dan in they had stepped forward to intercept us. "Dr. Staley?" the man said. "My name's John Cooper, this is Helen Reese. I wonder if we might have a word with you?" He gestured down the hall to where the door of a small lounge was visible.

"We have an appointment with Dr. Jordan," I put in.

"He's not back from class yet," Mrs. Reese said. "This will only take a few minutes, if you don't mind."

Dan shrugged. "All right," he said agreeably.

The others remained silent until we were seated in a small circle in a corner of the otherwise deserted lounge. "Dr. Staley, we understand you're planning some sort of experiment with Dr. Jordan to determine when life begins," Cooper said, leaning forward slightly in his chair. "We'd like to ask you a few questions about this, if we may."

Dan cocked an eyebrow. "I fail, first of all, to see how you learned about my private conversation with Dr. Jordan," he said calmly, "and, secondly, to understand what business it is of yours."

"Mr. Cooper is the Bay area president of the Family Alliance," I told him. "Mrs. Reese is their chief anti-abortion advocate."

They both looked at me with surprise.

"I see." Dan nodded. "Well, that explains the second part of my question. You folks want to take a crack at the first part now?"

"How we heard about it is unimportant," Mrs. Reese said. "What *is* important is that we find out how you stand on the abortion issue."

Dan blinked. "Why?"

"Surely, Doctor, you understand the highly subjective nature of the experiment you're planning," she said. "Naturally, we need to know what your own beliefs are concerning when life arises."

"My telepathic ability is *not* subjective," Dan said, a bit stiffly. "It's as scientific and accurate as anything you'd care to name. Whatever my beliefs happen to be, I can assure you they do *not* interfere with either my perception or interpretation."

"Beliefs *always* affect interpretation, to one degree or another," Cooper said. "Now, you yourself said you could prove the fetus wasn't human until the second trimester of pregnancy. It seems to us that, with such an attitude, you would be very likely to interpret any brain activity before that point as 'non-human,' whether it is or not."

Dan looked at me. "Iris?" he invited.

I nodded. "The exact quote, Dr. Cooper, was as follows: 'At worst, I may be able to show that a fetus *isn't* human during the entire first month or trimester or whatever.' End quote. Dr. Staley made no assumptions in that statement. I suggest you ask your spies to be more accurate in the future."

Reese bristled. "We weren't spying on anyone, Miss Marx; the information relayed to us was obtained quite legitimately."

"I'm sure it was," Dan said, getting

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to his feet. "Now if you'll excuse us, Dr. Jordan is expecting us."

The rest of us stood, as well. "We haven't finished our conversation, though—" Cooper began.

"Yes, we have," Dan interrupted him. "If—*if*, mind you—I do this experiment it'll be because I'm convinced it can be done objectively and accurately. If you have any suggestions or comments you're welcome to write them up and send them to my office. Good day."

Threading between them, we left the lounge.

Jordan and Dr. Pamela Halladay were waiting for us when we arrived back at Jordan's office. "Sorry we're late," Dan told them after quick handshakes all around, "but we ran into the local ethics committee. Any idea how the Family Alliance might have overheard our conversation, Dr. Jordan?"

The two of them exchanged glances, then Jordan grimaced. "My secretary, probably," he said. "I called Pam right after I talked to you, and the door to her office was open. I'm sorry; it never occurred to me that she'd go off and tell anyone."

"No harm done," Dan shrugged. "Let's forget it and get down to business, shall we?"

"Your idea sounds very interesting, Dr. Staley," Halladay said, "but I think there are one or two technical points that need clearing up. First of all, would you be following a single fetus from conception to term, or would you try to reach a group of fetuses at various stages of growth?"

"I hadn't really thought that much about it," Dan said slowly. "I suppose the second method would be faster."

"It would give better statistics, too," Jordan said. "What do you think, Pam—would a hundred be enough?"

"A hundred subjects?" Dan said, looking a little taken aback.

"Well, sure. If you want this to have scientific validity you'll need a reasonable sample. Why?—did you have a smaller number in mind?"

"Yeah. About ten." Dan frowned. "Maybe we could compromise at twenty-five or so."

"You cut the sample too small and it won't be scientific enough to satisfy the skeptics," Jordan warned.

"Whether it'll be scientific enough anyway was my second question," Halladay put in.

We all looked at her. "What do you mean?" Jordan asked.

"Oh, come on now, Eliot—the heart of the scientific method is the reproducibility of an experiment. With only one proven telepath on Earth, this one is inherently unrepeatable. Whatever Dr. Staley concludes we'll have to take on faith."

"Are you suggesting I might lie?" Dan asked quietly.

"No—I'm suggesting you might misinterpret what you hear. How are you going to know, say, whether the differences you see are human versus nonhuman or simply four months versus two months?"

Dan nodded. "I see. I wondered why you hadn't told Dr. Jordan you'd seen Cooper and Mrs. Reese loitering out in the hall earlier. You called them down on us, didn't you?"

Halladay's face reddened. "No,

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[illegible] look. I didn't expect anyone to come out here and ambush you like that. I just wanted to know whether you were pro- or anti-abortion: if you'd ever taken a public stand on the issue. I mean, they keep files on that sort of thing."

Jordan was looking at his co-worker as if she'd just shown a KGB membership card. "Pam! What on *Earth*—"

"It's all right, Dr. Jordan. As I said before, no harm done." Dan turned to Halladay, and there was a glint in his eye I didn't often see. "I'll tell you what I told your friends: I'm not doing this to push anyone's opinions, and that includes any *I* might have. If you have to pigeonhole me anywhere, put me down as 'pro-truth.' I won't wear any other labels, understand?"

"Yes. I'm sorry, Doctor." She smiled wanly. "I guess I'm not immune to the emotions the whole subject generates. I'll keep my feelings to myself from now on—I promise."

"Will you prove your sincerity?" Dan leaned forward and offered his hand.

She frowned at it for a second before understanding flickered across her face. Then, visibly steeling herself, she reached out and gingerly took his hand. They held the position for nearly twenty seconds before Dan released his grip and sat back. "Thank you," he said. "I'm sure you'll be a great help to us." Turning to Jordan, he nodded. "Now then, are we ready to begin working out some of the details?"

The discussion took nearly an hour, and the experimental design arrived at was essentially the one that was actually used later that year. Several important problems still remained, however, notably the question of masking the mother's thoughts while Dan tried to touch those of the fetus. From past experience we knew that a deep, sedative-induced sleep would probably do the trick, but Jordan was understandably opposed to giving large dosages of such drugs to pregnant women. The question of whether or not Dan could recognize humanness in a fetal mind at all also remained unanswered.

During the drive back to San Francisco, I asked Dan if Halladay could be trusted.

"I think so," he said. "I didn't see any evidence of duplicity when I touched her. And she *was* genuinely upset to find the Family Alliance people lying in wait for us."

"What about them? Do you think they'll make trouble?"

"How could they? Denouncing the experiment before it even takes place would make them look silly—especially since a check with Halladay will show them that the design still has some pretty basic problems. Saying this far in advance that they reject the results will leave them wide open to a charge that they're afraid of the truth."

Something in his voice caught my attention. "You sound less optimistic than you did yesterday," I said. "You thinking of calling it all off?"

He was silent a long moment. "No, not really. It's just that the whole thing is getting more complicated than I'd envisioned it."

I shrugged. "True—but don't forget that it's *your* experiment. If you don't want to do things Jordan's way, all you have to do is say so."

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"I know. But he's unfortunately got a good point: that if we don't at least take a stab at doing things rigorously, all we're going to do is throw more gasoline at the emotional bonfire." He paused. "Tell me, do you have any relatives or close friends who are pregnant?"

I blinked at the abrupt change of subject. "Yes—four to nine, depending on how close a friend you need."

"Let me have a fast rundown, will you?"

I drove one-handed for a while as I gave him a brief personality sketch of each of the nine women. Afterward he sat silently for several minutes, digesting it all. "What do you think Kathy would say if I asked to be present at her delivery?" he said at last.

"I don't know," I said. "But I know the right person to ask."

We called Kathy as soon as we got back to Dan's office. Though clearly surprised by the request, she agreed to act as Dan's guinea pig, provided her husband didn't object. I got the most recent estimate of her due date—another month—and extracted a promise of secrecy before hanging up. "You going to tell Jordan and Halladay about this?" I asked Dan.

He shook his head. "No, I don't think so. A slip of the tongue could have the entire Fresno chapter of the Family Alliance descending on Kathy's birthing room, and I have no intention of putting the Ausberrys through that."

"Besides which, if you find you can't even read the mind of a baby that's only hours from birth, you don't want anyone to know?" I hazarded.

His slightly pained smile was my only answer.

But the Family Alliance was subtler than we'd expected, and neither of us was prepared for the page-twenty story in the *Chronicle* the next morning.

"I don't *believe* this," I fumed, stomping around Dan's office with a copy of the paper gripped tightly in my hand. "How can they print something like this without at least contacting you first?"

" 'The Lifeline Experiment,' " Dan quoted, reading at his desk. "Gack. Why do newspeople always have to come up with cutesy titles for everything? Contact me? Of course they should have. Obviously, some fine upstanding citizen or group of same convinced them that the story didn't need checking."

"Someone like our Family Alliance friends?"

"Undoubtedly. You'll notice they don't include any of the details we discussed yesterday, which implies Halladay has dried up as an information source for them. I guess that's something."

"*How* can you sit there and take it so calmly?" I snapped, slapping my newspaper down on the desktop for emphasis. "Look: there it is for the whole damn world to see."

He looked up at me. "Simmer down, Iris—the first client's due in ten minutes and the last thing he'll want is to have his head taken off by my secretary. I'm mad, too, but there's nothing we can do now except make sure the experiment comes off as planned."

I was only listening with half an ear.

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"But *why*? What did they expect to gain by leaking the story? It's not even particularly slanted."

"Sure it is," Dan contradicted me. "Sixth paragraph, fourth and fifth sentences."

"'In addition to his private psychiatric practice, Staley does volunteer counseling once a week at the Rappaport Mental Health Clinic of San Mateo County, which he helped found. He also works frequently with the public defender's office and has worked with the Greenpeace Save-The-Whales Project.'" I rattled off. "So?"

"So someone realized that this was going to be a very difficult experiment to do. So difficult, in fact, that we conceivably might have to give it up—and that someone wanted to make sure I was established in the public mind as a liberal right from the start. A liberal and, by implication, pro-abortion."

I still don't see—oh. Sure. If the experiment turns out to be unworkable they'll claim you learned something in the initial stages that clashed with your liberal views on the issue, won't they, and that you backed out because of it."

"Bull's-eye. Or so I'm guessing."

I sat down, my anger replaced by a sudden chill. "Who exactly are we up against here—the Family Alliance or the CIA covert operations group?"

"We're up against people who've been up to their necks in politics for at least a decade," he told me, laying his own paper on top of mine. "Along the way they've probably picked up all the standard political tricks one can employ against an opponent—which is almost funny, since the experiment has just as much chance of supporting their point of view as it has of opposing it."

"One would think they haven't much faith in their beliefs, wouldn't one?" I suggested.

"I think that's a self-contradictory sentence, but you've got the right idea," Dan said, smiling. "And you might remember that any group that size is a mixed bag. Some of the members would probably be madder than you are if they knew what was being tried here." He tapped the newspaper.

Just then there was a knock on the outer office door. "Mr. Raymond's early," I commented, heading out to unlock it.

"No problem," Dan called after me. "You can send him right in."

But it wasn't Raymond, or any of Dan's other clients. It was, instead, a committee of four people.

"We'd like to see Dr. Staley for a moment, if he isn't too busy," their spokeswoman, a young woman with a recognizable face, said briskly. Without waiting for a reply she started forward.

Out in Hayward I'd been taken by surprise, but here in my own office I had better control of things. I remained standing in the doorway, and the woman had to pull up sharply to keep from running into me. "I'm sorry, Ms. McClain, but Dr. Staley is expecting a client," I said firmly. "If you'd like to make an appointment he has an hour available a week from Friday."

It was abundantly clear from her expression that she hadn't expected to be put off like that, but she recovered quickly. "Perhaps Dr. Staley will be able to squeeze us in between appointments later this morning," she said.

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"Would you tell him Jackie McClain and other representatives of the National Institute for Freedom and Equality are here? We'll wait until he's free."

I couldn't legitimately deny them waiting room space, so I let them in, hoping that what I knew would be a long wait would discourage them. Three of them did eventually give up and leave, the last one about one o'clock, with whispered apologies to their leader. But McClain stayed all the way until Dan's last client left at five-thirty, a persistence I had to admire. I consulted briefly with Dan and he agreed to see her.

"I'm sorry you had to wait so long, Ms. McClain," he said as we all sat down in his office. "But as Iris said, this was a particularly long day."

"She's a very efficient secretary," McClain said ambiguously. "I'll get right to the point, Dr. Staley: this so-called Lifeline Experiment. We'd like to know exactly what it is you intend to prove."

Dan frowned. "I'm not out to *prove* anything, really. I'm simply trying to find where in its development a fetus becomes a human being."

"In what sense? Medical, moral, legal—there are several ways to define *human*, and they don't necessarily correspond."

"I'm not sure I understand the question," Dan said, frowning a bit.

"Suppose you discover that, in your opinion, human life begins during the third month of pregnancy," McClain said. "The Supreme Court earlier this year stated that abortions through the sixth month are legal, which implies that a fetus is not *legally* human through that point."

"In that case the law would have to be changed, obviously," I told her.

"Obviously, you've never been pregnant with a child you didn't want," she said, a bit tartly. "A law like that would condemn thousands of women to either the trauma of an unwanted pregnancy and labor or to the danger of an illegal abortion. It would necessarily put the rights of a fetus over those of her mother—a mother whose rights, I'll point out, *are* clearly and definitely guaranteed by the Constitution."

"I understand all that," Dan said, "but I don't really know what to do about it. I'm not trying to make a legal or political statement with this, though I'm sure others will probably do so. But, then again, shouldn't the law reflect medical realities wherever possible?"

"Yes—but you're talking metaphysics, not medicine," McClain returned. "And as far as the law goes, what right do you or any other man have to tell women what we can or cannot do with our own bodies?"

"Just a second," I put in before Dan could reply. "Aren't we jumping the gun just a little bit here? Dr. Staley hasn't even *done* the experiment yet and already you're complaining about the results. It's entirely possible that the whole thing will be a boost to your point of view."

"You're right, of course," McClain admitted, cooling down a bit. "I'm sorry, Doctor; I guess I forgot that working with Pamela Halladay didn't automatically mean you were against us."

Dan waved a hand. "That's all right," he said, clearly thankful the argument had been temporarily defused. "I was unaware when we started that Dr. Hal-

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laday had strong feelings on the subject, but I'm convinced she'll be able to keep her feelings under wraps."

"I hope so." McClain paused. "I wonder, Doctor, if you would consider allowing a member of NIFE to participate in the planning of your experiment? We have quite a few doctors and other bioscience people who would be qualified to understand and assist in your work."

"Actually, I don't think we really need any help at the moment," Dan said slowly. "There are only a couple of problems to be dealt with, and I'm sure we can find solutions reasonably quickly. If not, I'll keep NIFE in mind."

"Will we at least be permitted to have an observer present during the main part of the experiment?" McClain persisted.

"If it'll make you feel better, sure," Dan said tiredly. "Give Iris your phone number and we'll do our best to keep you informed."

She gave me the number and then stood up, her expression that of someone who's gotten more or less what she hoped for. "Thank you for your time, Doctor. I hope this Lifeline Experiment of yours will prove to be something we can wholeheartedly support."

I saw her out and returned to Dan's office. "Is it my imagination," I asked, "or is this project starting to get just a little out of hand?"

He shook his head. "I can't believe it. First the Family Alliance and now NIFE—people are practically standing in line for a chance to complain about the experiment. Is the opportunity to find out the truth really so frightening?"

"I thought all psychologists were cynics," I said. "Of *course* nobody wants to hear facts that'll contradict their long-held beliefs. And organizations are even worse than individuals."

"*I'd* rather know what the truth is," he countered. "So would you. Are we the only intellectually honest people around?" He held up a hand. "Skip it. I'm just tired. Let's go somewhere quiet where we won't run into a hit squad from the PTA and get some dinner."

Sometime that evening both the wire services and the major networks picked up on the story, and by the next morning the entire country was hearing about the Lifeline Experiment—the name, unfortunately, having been picked up as well. Commentaries, both pro and con, appeared soon after. Though the publicity was stifling to Dan's everyday work, I think he found a grim sort of amusement in watching the creative ways various organizations phrased their statements so as to condemn the experiment without actually saying they would reject its results. Only the most fanatical were willing—or clumsy enough—to burn such a potentially useful bridge behind them.

The reporters who began hanging around Dan's home and office were more of a nuisance, but Dan had years ago mastered the art of giving newspeople enough to keep them satisfied without unduly encouraging them to keep coming. Fortunately, though, as the initial excitement passed and the experiment itself still seemed far in the nebulous future, the media's interest waned, and within ten days of the story's initial release the reporters' physical presence was replaced by periodic phone calls asking if anything was new. I, at least, was relieved by this

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procedural change; my friend Kathy would be calling any day now, and I preferred sneaking away from telephones than from people.

Late one evening in the last week of June the call came, and Dan and I drove down to Fresno for the birth of Kathy's third daughter.

It was the first birth I'd ever seen, but even so I gave the main operation scant attention; I was far more interested in what Dan was doing. The obstetrician, a close family friend, had been clued in, but I could still sense his professional uneasiness each time Dan's ungloved hand probed gently into the birth canal. What was visible of Dan's expression above his mask indicated a frown of intense concentration that remained even when his hand had been withdrawn, a look that silenced the questions I was dying to ask. He reached into the canal four times during the labor, and in addition had a hand on the baby's head from its first appearance to the moment when the crying child was laid across her mother's breast.

"What did you find out?" I asked him a few minutes later, after our tactful withdrawal from the birthing room. "Can you reach the baby through its mother's nervous system?"

"Yes," he said, absently picking at a bloodstain he hadn't quite managed to get off his finger. "Once I knew what I was looking for I could find it even with the loud interference from Kathy's mind. I wouldn't want to try it with a baby much farther from term, though —we're still going to have to find a safe way to knock out the mothers."

I nodded. "How about . . . humanness?"

"No doubt," he said promptly. "Those people who want to believe the first breath is the dividing line are fooling themselves. Elizabeth Anne's mind was as human as ours in there."

" 'Elizabeth Anne'?"

He smiled sheepishly. "Well, that's the name they were planning for a girl. I sort of picked that up along the way." The smile vanished. "Picked it up through a *lot* of real trauma. I don't think I ever realized before how much it *hurts* to have a baby—I'm exhausted, and I only got it second hand."

"Why do you think they call it labor?" I asked, only half humorously. He grimaced, and I quickly changed the subject. "So what does a baby think about in there? I mean, she couldn't have all that much sensory experience to draw on and certainly wouldn't have what we'd consider abstract thoughts."

"Oh, there really was a fair amount of sensory input—tactile and auditory mostly, but taste and even vision also got used some." He shook his head thoughtfully, his forehead corrugated with concentration. "But it wasn't the use of her senses, or even the way that such information was processed that made her a human being. It was—oh, I don't know: a feeling of *kinship*, I guess I'd have to say. Something familiar in the mental patterns, though I'll be damned if I can describe it."

"Whatever it was didn't change at the actual birth?"

"Not really. There was a sudden sensory overload, of course, but if anything it heightened the feeling . . ." He trailed off, then abruptly snapped his fingers.

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"That's what it was. On some very deep level the baby felt herself to be an *individual*, distinct in some way from the rest of the universe."

"I didn't think even young children understood that," I said.

"On a conscious level, no—but that part of the mind seems to be the last to develop, long after the more instinctive levels are firmly in place. Now that I think about it, I've picked up this sense of distinctness in babies before—even in the Kilogram Kids I worked with at Stanford last year—but just never bothered to put a label on it."

I pondered that for a moment. "Is that the yardstick you're going to use, then?"

He shrugged uncomfortably. "Unless I can come up with something better, I guess I'll have to. I know it sounds like pretty flimsy evidence, but it really seems to be an easy characteristic to pick up. And I'm sure I've never felt it in any of the other mammals I've touched."

"Um. It still sounds awfully mystical for an experiment that purports to be scientific."

"I'm sorry," he said with a touch of asperity. "It's the best I can do. If you don't think it's worth anything we can quit right now."

I took his arm, realizing for the first time just how heavily the national controversy was weighing on him. "It'll be all right," I soothed him. "As long as people know exactly what you're testing for, no one will be able to claim you misrepresented either yourself or the experiment."

"Yeah." He sighed and looked at his watch. "Two-thirty. No wonder I'm dead tired. Come on, Iris; let's go say good-bye to your friends and get out of here."

For a wonder, the news of our unofficial test run didn't leak to the media at that time, and so Dan was spared the extra attention such a revelation would have generated. As it was, public interest—which had remained at a low level for the past two or three weeks—began to rise again as the procedural problems began to be worked out and Jordan announced a tentative date of July 25 for the experiment to take place.

In light of the recently discovered papers, there is one conversation from that period that I feel must be included in this report.

It took place on the evening of July 12 at the home of Ron Brady and his wife Susan. It had been only the previous day that Halladay's idea of using electrical sleep stimulation had been proved adequate for Dan's needs, removing the final obstacle still holding things up.

"So the Lifeline Experiment's going to come off after all," Ron said after the dinner dishes had been cleared and the four of us had settled down in the living room.

Dan nodded. "Looks that way. Eliot and Pam are lining up volunteers now; they expect to have that finished in ten days at the most." He cocked an eyebrow. "You seem disapproving, somehow."

Ron and his wife exchanged glances. "It's not disapproval, exactly," Ron said hesitantly, "and it's certainly not aimed at you. But we *are* a little worried about the potential influence this one

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experiment is going to have on the way people think about abortion and human life in general, both here and in other countries."

Dan shrugged. "I'm just trying to inject some facts into the situation. Is influencing people to use rational thought instead of emotion a bad thing?"

"No, of course not," Susan said. "But what you're doing and what the public *perceives* you as doing are not necessarily the same. You're searching for the place where a fetus's mind becomes human; but a person is more than just his mind. Will the Lifeline Experiment show where the child's soul and spirit enter him? I'm not at all sure it will."

"That almost sounds like quibbling," I pointed out. "If Dan can detect a unique humanness in the mind, isn't that basically the same thing as the soul?"

"I don't know," Susan said frankly. "What's more, I haven't the foggiest idea of how you'd even begin to test that kind of assumption. It's just the fact that the assumption *is* being made that concerns me."

"The problem we see," Ron put in, "is that the media isn't bothering with this—to us, at least—very important point, but is preparing the public to expect a clear-cut answer to come out of the experiment. What's worse, every organized group that sees support for their point of view will immediately jump on the bandwagon, reinforcing the media's oversimplification. Do you see what I'm getting at?"

"Yes." Dan pulled at his lower lip. "Iris, have I been clear enough with the media as to exactly what the Lifeline Experiment will and won't show?"

Dan had talked to reporters over a hundred times since the story's first appearance; quickly, I played back the relevant parts. "I think so," I said slowly. "Especially since our trip to Fresno."

"The media's not picking up on it," Ron insisted.

I nodded. "He's right, Dan. I haven't seen any major newspaper or TV report even mention questions like Susan's, let alone seriously discuss them."

Dan pondered a moment. "Well, what do you think I should do about it? I could yell a little louder, I suppose, but evidence to date indicates that won't do a lot of good."

"I tend to agree," Ron said. "You've been something of a folk hero since you fought the National Academy of Sciences and won, but the extremists—on both sides—have louder voices. I'm afraid yours would probably get lost amid the post-experiment gloatings and denunciations."

"Do you think I should cancel the whole thing, then?" Dan asked bluntly.

For a moment there was silence. Then Susan shook her head. "I almost wish you could, or at least that you could postpone it for a while. But at this late date canceling would probably just start fresh rumors, with each faction trying to persuade people that you'd quit because you'd learned something that supported their particular point of view and conflicted with your own."

Dan's own words the morning the story appeared in the *Chronicle* came back to me; from the look on his face I knew he was remembering them, too. "Yeah," he said slowly. "Yeah, I guess you're right."

I think we all heard the pain in his

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voice. Susan was the first one to respond to it. "I'm sorry, Dan—we didn't mean to add to the pressure. We're not blaming you for what other people are doing with your words."

"I know," Dan said. "Don't worry about it—the pressure was there long before tonight." He sighed. "I really wasn't expecting it to be so intense, somehow. It wasn't nearly this bad when I was trying to prove my telepathic ability, not even when they were calling me a criminal fraud on network TV. I must be getting soft in my old age."

"I doubt it," Ron said. "The problem is more likely that last time *you* were the only one under the hatchet, so to speak, whereas this time your actions are going to be affecting the lives of others. You're suffering because, whatever happens, the Lifeline Experiment is likely to hurt some group of people. That's an infinitely heavier burden for someone like you than watching your own name dragged through the mud."

Dan nodded. "I wish I'd thought about that two months ago. If I'd known how I'd react, I'd never have started this whole thing in motion."

"Well, if it makes you feel any better," Susan said gently, "it's only *because* you're so sensitive that Ron and I aren't more worried about the experiment. We can trust you, at least, to be as honest and fair-minded in what you report as is humanly possible."

"Thanks." Dan took a deep breath, let it out slowly. "Let's change the subject, shall we?"

There are films of the Lifeline Experiment itself, of course, films that have been shown endless times over the past twenty years. I have seen them all and do not deny that they adequately portray the physical events that took place on July 25, 1994. But there was more than just a scientific test taking place that day. There was a battle taking place in Dan's own mind, a battle between what his senses told him and what his reason could accept; and it was this unresolved conflict, I know now, that ultimately led to the secret study whose results have only now come to light.

Dan and I arrived at the small lecture room where the experiment was to take place just before one o'clock. The TV and film cameras had long since been set up, and the spectators' gallery was crammed with nearly fifty reporters and representatives of interested groups. I glimpsed Eve Unger, NIFE's handpicked representative, and John Cooper of the Family Alliance sitting several rows apart. Near the front, in seats Dan had had reserved for them, were Ron and Susan Brady.

The front of the room looked uncomfortably like a morgue. Laid out in neat rows were thirty waist-high gurneys, each bearing the form of a sleeping woman. From the neck down each was covered by a pup tent sort of arrangement designed to give Dan limited access to the area near the uterus while minimizing physical cues that might otherwise influence him. A number was sewn onto each tent, corresponding to a numbered envelope containing the woman's name and length of time she'd been pregnant. At a raised table at one end of the floor sat Jordan, Halladay, and John Cottingham of the Associated Press, who held the stack of envelopes.

"We're all set here, Dan," Jordan

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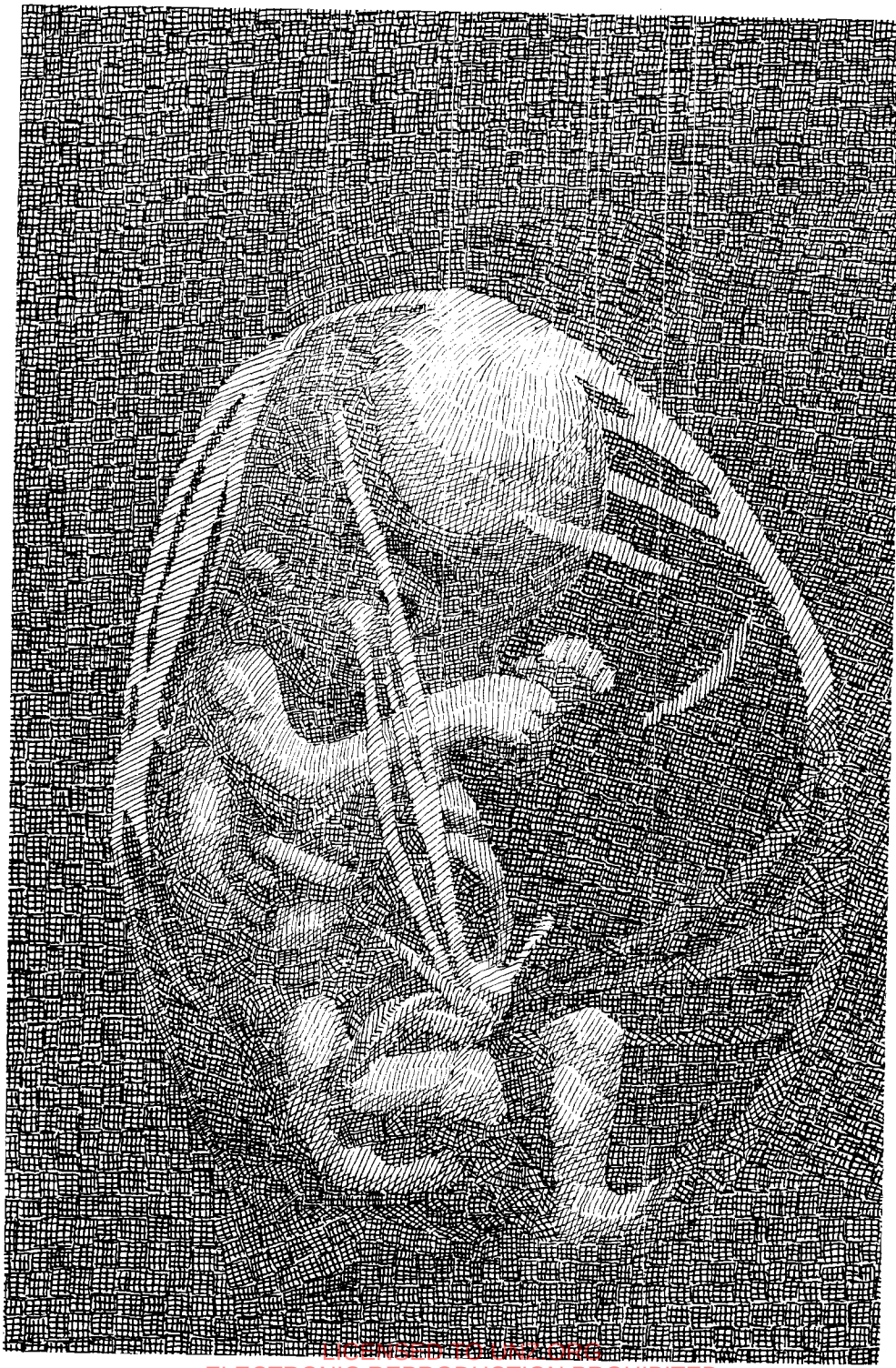

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said as we reached the table. "You can begin whenever you want."

Dan nodded, and as I slid into my own front-row seat he stepped to the nearest gurney. With a single glance at the cameras, he reached into the tent's access tunnel. Almost immediately he withdrew his hand and silently picked up the numbered card lying on the gurney beside her. Marking one of the squares on the card, he stepped carefully over the sleep stimulator wires and walked to the table, placing the card face down in front of Cottingham so that only its number showed. "Is it a boy or a girl, Dr. Staley?" the reporter quipped, sliding the card to one side without turning it over.

"I'm not even going to try to guess, Mr. Cottingham," Dan said. A slightly nervous chuckle rippled through the spectators; but I could see that Dan hadn't meant the comment to be funny. Not even a hint of a smile made it to his face as he walked back to the next gurney. He held the contact a little longer this time, but there was no hesitation I could detect as he picked up her card and marked it. Cottingham didn't try any jokes this time, and Dan went on to the third woman.

All the reports I've ever seen refer to the tension in the room that afternoon; what they don't usually mention is the strangely uneven quality the experimental setup imposed on it. Dan had expected—correctly, as it turned out—that the younger the fetus, the harder it would be to make both the initial contact and the determination of its humanness. But with the random order and the camouflaging tents it was impossible for anyone watching to tell how far along a given mother was. With some, the spectators would barely have settled into a watchful silence before Dan was walking away with the card; but with others, he would stand motionlessly for minutes at a time as the tension slowly grew more and more oppressive. At those times, his movement toward the card was like a lifting of Medusa's curse, and there would be a brief flurry of noise as people shifted in their seats and whispered comments to each other. The reprieve would last until Dan started his next contact, and the tension would then begin its slow rise again.

The first forty-five minutes went smoothly enough, both Dan and the spectators quickly growing more or less accustomed to the emotional roller coaster ride we were on. Dan made decisions on seventeen fetuses during that time, and while he was clearly not having fun up there, I could tell from his face that he was holding up reasonably well against the pressure.

The eighteenth subject changed all that.

Dan stood by her for nearly five minutes, his face rigid with concentration and something else. Finally, leaving her card untouched on the gurney, he stepped over to the table. "There's something wrong," he said, his voice low but audible from where I was sitting. "I can't find any life at all in there. I think the fetus must be dead. I . . . please don't release the moth— the woman's name. It's going to be hard enough on her as it is."

Jordan tapped Cottingham's arm and muttered something. The reporter grimaced slightly, but gamely shuffled out the proper envelope and opened it. His

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frown vanished as he read the contents and he smiled wryly. "Number twenty-eight. Linda Smith; not pregnant. Control."

There was a collective sigh of released tension. An unreadable expression flickered across Dan's face as he glanced at Jordan and Halladay. Then, clamping his jaw tightly, he walked back to the gurneys. To others in the room he may have simply looked determined—but I knew better. He was flustered and flustered badly. He'd counseled several women in the past who'd given birth to stillborn children, and dropping the memory of that trauma into the middle of an already emotional experience must have been like a kick in the head. The fact that he obviously hadn't even considered the possibility of a control was clear evidence of his overwrought state. I wondered briefly if he would call for a break, but I already knew that he wouldn't permit himself that luxury. He had fought hard these past few weeks to portray himself as a calm, dispassionate scientist who could make the Lifeline Experiment a genuinely impartial search for truth, and he would turn his stomach into a massive ulcer before he would undermine that effort with even a suggestion of weakness.

From that point on, Dan's face was a granite mask, and for the next forty minutes I sat helplessly by, grinding my fingernails into my palms.

The silence in the room as Dan handed Cottingham the last card was so complete that I could clearly hear the ticking of Jordan's antique wristwatch. Picking up the first of his envelopes, Cottingham opened it. "Number twenty-three," he read into the microphone, enunciating his words carefully. "Alice Grant; nine months pregnant." Reaching to the line of cards in front of him, he turned the corresponding one over. "Human," he read. Card and envelope went to one side, and as he opened the second envelope I shifted my attention to Dan. He had stepped back among the gurneys and was watching Cottingham, his expression calm but with a strange, brittle quality to it that sent a sudden shiver up my back. "Number one. Vicki Thuma; eight and a half months pregnant," Cottingham read. Pause. "Human."

One by one he worked his way down the stack, finishing with the third-trimester mothers and starting on those in their second three months . . . and as each card he picked up identified the child as fully human, the silence began to give way to a buzz of unsure conversation. Cottingham read on; and as he reached the first-trimester women the buzz took on edges of both triumphant and angry disbelief. No one, I sensed, had really expected the result that was unfolding.

He reached the last envelope, and as he tore it open the room suddenly became quiet again. "Number fourteen. Barbara Remington; five weeks pregnant." His hand was trembling just slightly as he turned over the final card. "Human. Human," he repeated, as if not quite believing it.

"That's impossible!" Eve Unger's clear voice cut through the silence, a fraction of a second before the whole room exploded into pandemonium. "A fetus's brain has hardly *started* development at five weeks," she shouted

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over the din. "It's a fraud—Staley's been bought by the Family Alliance!"

Dan didn't reply, though anything he said would have been inaudible anyway through the accusations, claims, and counterclaims filling the air like opposing mortar barrages. He just stood there, looking up at the NIFE representative, his expression still calm. He knew what he'd seen and would not be moved from his testimony. And yet, as I look back on his face now, I can see the faintest hint of the uneasiness—the knowledge that what she said made sense—that I now know must have haunted the last fifteen years of his life.

Of the aftermath there is little that isn't common knowledge. Though the Lifeline Experiment carried no legal weight whatsoever, it was very clearly the rallying point for the final successful drive that established the Fetal Rights Amendment in the Constitution. But the bitter struggle that surrounded the issue made it a Pyrrhic victory at best, threatening at times to tear the country apart as had no issue since the Vietnam War. It was too much for Dan to bear at close range, and for eight years after the experiment he remained outside the country, living in self-imposed seclusion in Australia. I think that the only thing that got him through that period was the knowledge that he *had* seen humanity in those tiny bits of new life, and that whatever the cost he had done the right thing. Eventually things settled down, the pro-abortion forces gradually losing strength as grudging acceptance of the new law grew, until they became the vocal but powerless minority of the present day. And I wish with all my heart the controversy could be left alone to continue its slow death.

But it can't.

I enclose the following excerpt from Dan's papers with a feeling of dread, remembering the agony of the past two decades as few others remember it and knowing that my action is likely to rekindle the fires again. But above all other things Dan prized his reputation for honesty, and it is solely because of this that I quote here the last entry from his private journal, made just two days before the car accident that took his life. I believe that, given the time, he would have come to the same conclusion.

October 18, 2009: I have been sitting here since the sky first began to show the colors of sunset, wondering how to write this. The stars now shine brightly where I watched the sun go down, and I am no nearer to finding a way to ease the shock of what my seven-year study has shown me . . . to finding a less brutal way to confess what I have unwittingly done to all the people who trusted me.

There can be no further doubt as to what I have done. Linda Grant, whose mother was nine months pregnant at the experiment, shows virtually none of the traits I myself showed as a teen-ager; at the other end of the scale Tom Remington, whose mother was only five weeks along, is so like me it is agonizing to watch him. Only today I learned that, while he has my passionate love of basketball, he does not intend to try out for the school team, despite his skill and height. There is no reason why he would not do well at the game . . . except that I was a mere five foot six at his age and convinced I could never play. All the

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rest of them fall somewhere between these two extremes, their individual degrees of mimicry directly correlated with their ages at the experiment . . . and for what I've done to these children alone I owe a debt I'll never be able to repay. What I've done to the country and the millions of women whose lives my naivete had changed—I can't even comprehend the enormity of my crime.

My crime. The word is harsh, unforgiving. But I can't justify it as anything else. In my foolish arrogance I assumed the universe was simple, that its secrets were absolute and could be had for the asking. Worse yet, I assumed it would bend its own rules just for my convenience.

The experimenter influences his experiment. How long has that truth been known? Close to a hundred years, I'm sure, at least since the earliest beginnings of quantum mechanics. Such a simple thing . . . and yet neither I nor any of those I worked with ever even bothered to consider what it might mean to us.

The Lifeline Experiment was doomed from the very beginning. Young minds, their development barely started—how could they fail to be overwhelmed as I touched them with what must have been the delicacy of an elephant? That flicker of humanness I saw in each fetus—how much of that was innate and how much merely my own imposed reflection? I'll never know. No one ever will. My very presence obliterated the line I was trying to find.

And in the meantime I have helped to force what is essentially an arbitrary decision on the country. What should I do with this knowledge? Do I keep it to myself and allow the lie to continue, or do I speak out and risk tearing the society apart once again?

I wish I knew the answer. ■

● The old utopian socialists of the 19th century—such as Saint-Simon, Owen, Fourier, and Marx—*lived* for the day of the liberated working-man. They foresaw a day when industrialism (Saint-Simon coined the word) would give the common man the things he needed in order to realize his potential as a human being: surplus (discretionary) income, political freedom, free time (leisure), and freedom from grinding drudgery. . . . The old boys never realized that it would come to pass as the result of a Go-Getter Bourgeois business boom such as began in the U.S. in the 1940s.

Tom Wolfe

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The Alternate View

DRY CENTAUR

Jerry Pournelle

One problem with the space program is that we have built a bureaucracy. Now, bureaucracies do certain things well. If you've a repetitive task to be performed often, bureaucracies aren't too bad at evolving procedures that get the job done. Sometimes the evolution is glacial, and usually the procedures don't look sensible from the outside, but often they work better than you think.

Example: There hasn't been a case of human rabies in Los Angeles County since 1937; yet there are rabid animals in the hills not half a mile from my house, and there are lots of dogs and cats that shuttle between the hills and people's homes. Rabies doesn't get from the hills to people because you must get your pet vaccinated for rabies before you can get an animal license, and Los Angeles has a very efficient bureaucracy that enforces the license laws.

Over the years, the Department of Animal Regulation has attracted the kind of people who will go out and snoop: who tirelessly ask about who has dogs in the neighborhood, and make certain all those dogs have licenses. That's the sort of job that would drive me mad, and indeed I can't really understand people who want to do that, but I'm very pleased that the job is done. It may not be done "efficiently"; there may be procedures that simply don't make sense; but it does get done, and I suspect that much of what I think of as "waste" is indeed necessary.

That is bureaucracy at its best.

It's at its worst in NASA.

When it was first put together, NASA was something really unique, an efficient organization for accomplishing tasks that no one really knew how to do. Think about it for a moment: Project Apollo was the largest and most complex operation in human history. The only thing mankind had ever done that even came close was Overlord, the D-Day invasion of Normandy.

Not only did NASA accomplish the primary task of landing a man on the Moon and safely returning him within the 1960 decade, but they did so under a severe handicap: they were forbidden to use the simple and easy way, which was simply to take existing rockets such as Atlas and Titan, improve them, and launch a bunch of stuff into orbit with them. The orbital stuff would then be put together to make a Moon ship.

When Kennedy announced we were going to the Moon, the cost per pound in orbit was high; but taking the highest figures, it still would have been *much* cheaper to use what we had. We would also have gotten an operational space station.

That was forbidden. Kennedy needed the support of Lyndon Johnson to get

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Apollo through Congress. Johnson had a price: reindustrialization of the South, with significant sums to be spent in Texas. The result was the Saturn development program with subsequent buildup of Huntspatch, Alabama; the Johnson Space Center in Houston; heavy investment in Michoud, Louisiana; etc.

Thus NASA was faced with both a public agenda—getting to the Moon—and the hidden agenda—spending lots of money to reindustrialize the South. It says a lot for NASA that they were able to do it. Of course, public relations suffered a lot: there wasn't any *real* way to explain to the public why things were being done the way they were. The hidden agenda had to stay hidden. But the jobs were done: development of what had been an underdeveloped nation, and putting a man on the Moon.

Thus was born the legend. NASA could do anything. And indeed, NASA was a success story in a time when there weren't many successes. What else has government done right in the last thirty years?

Alas, though, it couldn't last. Part of NASA's funds went into building organizational structure—or, to use another term, bureaucracy. Departments formed. Interests developed. Ties between NASA sub-departments and certain industrial firms were forged and became steel-clad, all but unbreakable.

The result is that NASA has become hide-bound, unable to respond to innovation.

It's understandable. Take a good engineer, specialize him, put him into a department where they do one and only one thing and they do that in a certain way, have him spend much of his professional life optimizing within those very narrow limits, and you cannot expect him to rejoice when you show that what he does is no longer needed.

The problem is that NASA has now been around long enough to evolve. People accustomed to quick decision-making, the kind of person who's impatient with endless studies and "but we've always done it that way," have mostly left. Not all of them; NASA is still among the most efficient organizations in the government. But most of them have gone, and many of those who are left have lost their enthusiasm.

I will never forget the day an associate administrator of NASA asked me, very seriously, "But why would *anyone* want to live on the Moon?"

Example: DRY CENTAUR.

The Centaur rocket system, which uses liquid hydrogen (LOH) and liquid oxygen (LOX) fuels, has been designated the upper stage for the Shuttle. There are a number of reasons for that. Unlike a solid upper stage, Centaur can be shut off and restarted, and even throttled. Centaur is a well-developed and well-understood engine with a good track record. It is badly needed for planetary missions, like Galileo, and also for manned space operations.

Centaur's major problem is safety. Carrying LOH and LOX in the Shuttle main bay is tricky. It requires a lot of plumbing. There's also considerable Ground Support Equipment (GSE) involved.

Some of the people studying space stations took another look at the problem. After all, there's lots of LOH and

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SOLVE
A GIFT
PROBLEM
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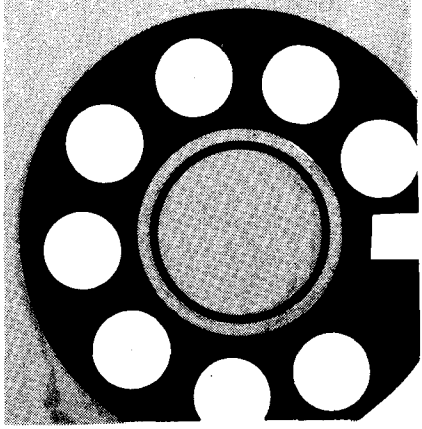

LOX aboard Shuttle: it's in that big External Tank (EXT), the one we splash into the Indian Ocean. If that tank were in orbit we could use it, and the energy costs for putting it in orbit are low — indeed, many studies show there's a negative cost; splashing the EXT requires a Shuttle maneuver.

If you could launch Shuttle with the Centaur dry, you'd save on a lot of piping and tankage. For example, there are two seventeen-inch pipes required for Wet Centaur. Their sole purpose is to provide lines for dumping the LOH and LOX overboard in case of a Return To Launch Site (RTLS) aborted flight.

LOX and LOH require cooling. That takes cryogenic hardware that would take up valuable space in the Shuttle cargo bay. It's also heavy enough to cut down significantly on the payload.

Worse than the cooling problem is ventilation. Hydrogen and oxygen vapors are explosive. It takes a lot of energy to get Shuttle into orbit. LOH and LOX make dynamite look pretty tame. Thus, if the Wet Shuttle isn't well ventilated, any spark could blow the doors off. Dry Shuttle, on the other hand, doesn't bring LOH and LOX into Shuttle itself until above 100,000 feet or so; at that pressure the mixture isn't able to detonate.

Studies I've seen show savings of 450 kg (nearly 1,000 pounds) in safety equipment, another 2500 kg in support equipment, and significant savings in the Centaur tankage itself. There are a number of other advantages.

The bottom line is a dramatic increase in payload to orbit, even without taking the external tank to orbit; and even larger savings if that valuable tank is

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saved rather than thrown into the ocean. The savings are even more dramatic for a Vandenberg launch: from under a hundred pounds to something like 4,000 pounds in geosynchronous orbit!

Of course, this is all based on studies; but they're studies by people who know what they're doing, and it doesn't take a lot of work to confirm. Everyone I know who's looked at Dry Centaur has been impressed. One seasoned veteran was chagrined because he hadn't thought of it a year ago.

The Dry Centaur concept was presented to NASA Shuttle people. They thought about it. As of this moment, the NASA policy is that this sounds like a great idea, and ought to be tried—but as a later "improvement" over the present planned system. That means that all the money will be spent to modify Shuttle and its launch pad to get the present wet system going, then more money spent to remove the modifications, tear out the seventeen-inch dump pipes, and go back to what they could have done more cheaply and more simply in the first place.

That may change, of course. The idea has not worked its way up to the decision-making levels in NASA headquarters. By the time you read this, they may be taking Dry Centaur seriously.

On the other hand, they may not be. This is only one of a dozen or so innovative ideas that are slowly, glacially, working their way up through the NASA bureaucracy.

What must be done?

Some engineers have so thoroughly despaired of improving NASA's decision process that they say seriously that nothing will happen unless you burn most of NASA to the ground.

This seems a bit extreme.

Better, I think, would be to rekindle some of the old enthusiasm that had NASA people working twenty hours a day on Mercury and Gemini and Apollo. We can also let them know that they're being watched: that space has devotees, *fans*, and that we expect real professionalism from our pros. We may not understand everything, but we're not stupid, either; we can recognize good work when we see it. This kind of communication happens all the time in the science fiction community; it needs to be transplanted to the space community. ■

● All errors in politics and morals are based on philosophical errors and these in turn are connected with scientific errors. There is not a religious system nor a supernatural extravagance that is not founded on ignorance of the laws of nature.

Antoine Nicolas de Condorcet, *The Progress of the Human Mind*, 1795

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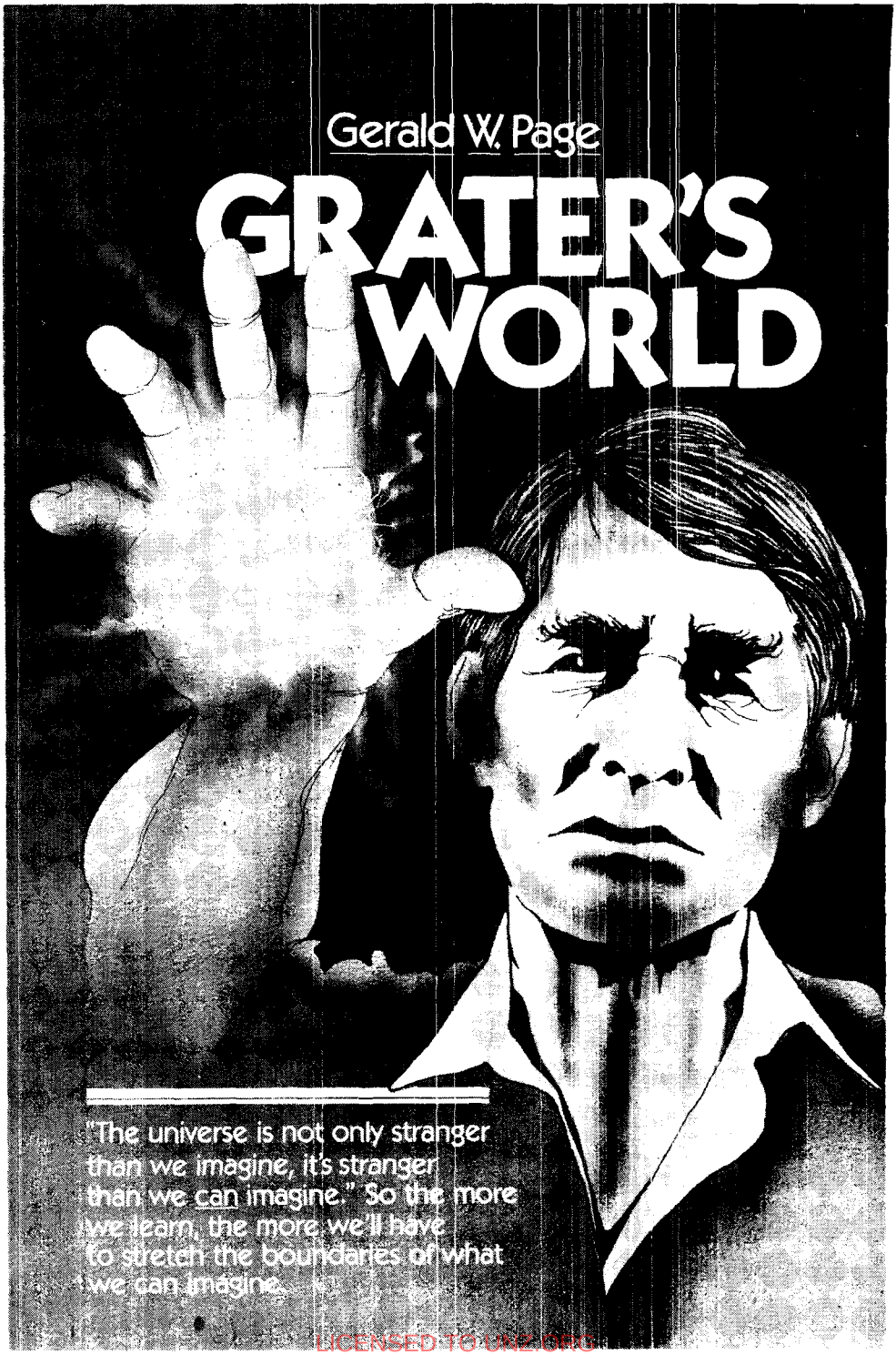
Gerald W. Page

GRATER'S WORLD



"The universe is not only stranger than we imagine, it's stranger than we can imagine." So the more we learn, the more we'll have to stretch the boundaries of what we can imagine.

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He was nearly dead when he found the world. He stepped forward, like a drunken man bursting through paper, out of the concourse of the Way and onto the planet's surface. He took two wild, staggering steps and dropped to his knees. He held himself there for a moment, swaying like a falling tree that was uncertain where to land, and stared straight into Grater's face. Mouth gaping, Grater stared back. "Say something," the man croaked. "God," Grater replied. The man's expression changed, softened with a mixture of gratitude and relief. He fell forward in a faint.

Grater reached out a thin hand and touched the fallen man's shoulder. He poked him tentatively. "Hey, are you all right?" Grater asked. The man neither stirred nor made reply. Grater swore and stood back up.

A small green globe of energy hovered about a foot above the ground. It was what Grater had been working on. Angry, and not for the first time in recent weeks, Grater shoved at the globe. It bobbed to the ground and bounced high into the night sky where it burst, showering green shooting stars among the cold, more permanent pinpoints of space. Grater swore again, then looked down at the man on the ground.

He bent down to see again about the intruder. The man was big. He wore tan clothing. By human standards, which were still Grater's standards despite his present disposition, the man was almost a giant. What belongings he had were carried in a small knapsack on his back but Grater wasn't interested enough in that to even look. The man seemed asleep: it was altogether likely he was exhausted. It was possible to overexert

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yourself in the Way if you were stupid enough, and Grater's opinion of his fellow humans was that most of them were more than stupid enough. He shook the man but couldn't wake him up. "Come on now," Grater said. "Hey, you got to get out of here."

On the sleeping, exhausted face of the intruder a smile appeared. Grater guessed the man was dreaming. Grater hadn't walked the Way in a long while, years possibly, but he remembered the dreams you could sometimes have after a long walk. Even angrier than before, Grater got to his feet.

"Shiva!" he said loudly.

The man remained where he was, sleeping.

Grater looked up at the sky. The green sparks had died away and the stars were cold and alone once more. So was Grater, but not enough alone. He turned and walked away, hoping the man would be decently gone by morning—but somehow, even then, knowing he wouldn't be.

Grater wouldn't learn it until morning, but the man's name was Edric.

Sometimes the Way is like bedrock under your feet and your strides are sure, like the strides of the man in the old Earth story of the seven-league boots. Sometimes, though, the Way turns playful and you seem to walk knee-deep in water. Or else your feet seem to touch firm ground that's rough and uneven. Though the Way is normally level and easy, there are times when the illusion is that you're climbing or descending, or both at once. The Way is multiform and the mind is active, however serene it pretends to be. Edric felt as if he were walking in deep, soft sand.

He had never before found difficulty in the Way. Nor silence. He had heard about the Silences, of course, but to him that was just a story. Until now.

At times, the worldsongs are like wind chimes, or cathedral organs, or bells. Even voices. The songs of some of the newer, more primitive worlds could at times be all percussion, the beating of rock on rock or sticks on a hollow log. Sometimes the songs were not songs at all, in the true sense, but sounds: rushing water or great winds or the creaking of ancient wooden ships at sea. Only now the songs were stilled and it was terrible to be a human in the Way, alone and intimidated and more than a little awed and very, very frightened.

No sound at all, not even the sound of Edric's breathing, for Edric was changed as men are always changed in the Way. The silence, the Silences, cut him off, left him abandoned, the only human in the universe.

And with no worldsong to find his path by.

All the old feelings, all the human things that had been discarded by people since they learned to walk the Way, all these things came back, one by one, or in pairs or small groups, small subtle things. Dry rustling poisons that had not been truly purged but only buried in the soul. Edric was afraid, and Edric had never been afraid before. He was no minstrel, this Edric, but he was human. So he sang. To fill the Silences.

He sang till his voice gave way and he sang as long as he could after that. Hoarse croaking songs that were sounds

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in utter silence. But the Silences were stronger than his songs: they challenged him. And won. His voice gave way and, finally, gave out. He could no longer sing. He was tired; not even the Way refreshed him. His feet seemed to drag through sand and without the beacon songs of the planets he was lost in a hopeless labyrinth of space from which he could find no exit world. Fear, which at first had been so strange as to be interesting, was fast becoming too personal a thing. Now it held no interest for him at all.

And then he heard the song.

It was no worldsong. He was hearing a woman's voice. Edric had never heard a voice like it before, but he was certain it was human. For one thing, only humans seemed to have access to the Way. It was believed that any race could break through the fabric of space and travel from world to world as man now did, but just at this point in history, none were known to do so except humans. It depended on the race's evolutionary stage, apparently. In the past there had been others and in the future there would be others, but just now the Way was open only to humans.

Besides, despite the unutterable, painful beauty of it, the voice was unquestionably human. A human woman who sang her poignant songs so clearly they could be heard in the Way.

Edric followed the voice like a beacon worldsong until it quit. The Silences engulfed him again, worse than before. Something seemed to grab his soul, to toss it as a rag doll is tossed by a playful dog

Then he found the world. Almost beaten by the Silences, he tore through the spatial fabric and staggered onto the planet's surface.

When he woke it was as if it all had been a dream.

He looked around and realized he was on a world he had never seen before. There was air. It was fairly breathable, though that wasn't much of a problem to a human who had walked the Way. There was light. The temperature was pleasant enough, maybe even a touch warm, but that was (at this level anyway) even less a problem than the air. Edric sat up.

He was on a narrow rock plain between twin ranges of tall jagged mountains. The world was gray and brown with plenty of sharp, protective shadows, at least to judge from what he could see of it. He remembered seeing someone. A man, not the woman he had heard. There was no one here now though, man or woman. Whoever it was had walked off and left him to sleep, which was all right with Edric since that had been what he needed at the time. But now he had questions and he longed to have them answered.

He was not particularly surprised that his knapsack hadn't been touched. The Way had changed mankind, after all. He found a packet of food and ate slowly, savoring the taste and the sheer sensation of using his muscles to eat: recovering some of the reality of which the Silences had drained him. When he finished eating, he went to find the man.

He found him on a small plateau some distance away, molding a shape out of shimmering blue material. The man, a small fellow who scowled at his work, gave Edric a glance from the corner of

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his eye, trying to make it seem he didn't notice the newcomer at all. Edric watched him work for almost an hour before he gave up and spoke a simple, "My name is Edric."

Grater kept on working.

"I said my name's Edric."

Grater acknowledged the statement with a nod.

"And your name?" Edric asked.

Grater turned his head. He scowled at Edric.

Edric smiled. "I'd like to know your name. But it is your right not to tell it to me."

"I know all about my right." There was a brief pause. "It's Grater."

"Grater," Edric repeated, trying the word out. "You been here long, Grater?"

"I'm busy."

He stood up on skinny legs and stepped back to look at what he had shaped.

It stood about three feet tall. The base didn't touch ground but hovered about a hand's width above it. That part of it seemed to have no particular shape to it, but moved and churned like water in a skin. Otherwise, the object seemed to stay pretty much as Grater had molded it, though it shimmered and did strange things to light. It seemed to resemble nothing but itself, to form some sort of intentional but indecipherable abstraction.

"I've never seen anything like it before," Edric said. "What is it?"

"My work," Grater said. He moved his hands lightly over the thing's surface, making slight corrections in the contours.

"No, I mean, what's it made of?" Edric asked, reaching toward it.

He came close enough to experience a tingling sensation like static electricity, but before he could touch it Grater stopped him. "Leave it alone," he said. "It's not finished. Anyway, I don't want you tampering and prodding at my work. Not you, not anyone."

Edric stood back. "I'm sorry. I didn't mean to interfere in what you were doing, I was just curious, that's all." He looked around. "What world is this?"

"Don't you know?"

"No."

Grater looked at him. "Then how'd you find it?"

"Believe me, it wasn't easy. I got lost in the Silences. Really lost. But I heard a song."

"In the Silences?"

"It wasn't a worldsong. It seemed to come from here. Anyway, this is where I ended up, wherever this is."

"Silences, hey?" Grater said. "So you weren't intentionally coming here, is that it? So why not move on now to wherever you were intentionally headed."

"I'm not anxious to go back into the Silences."

"The Silences move on, and the Way'll be full of worldsongs to guide you away from here. You won't have any trouble."

"I could use a rest. Besides, I'd like to search down that song I heard."

Grater scowled at him again. "You some sort of minstrel? Manawyddan knows there's enough of them cluttering up the Way now."

"I'm no minstrel."

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"Then why bother? What'll you do with the thing if you do hear it?"

"It's not the song," Edric said. He was speaking defensively, he realized, as if it mattered what this small angry man felt. "I want to find the one who sang it."

"A planet's a planet," Grater said. "Eyes of Mithra, man. You've walked the Way. Just open your ears and listen to the song, then get away from me. Away from my world."

"It's not the planet. I can hear this world's song now, a sort of low humming."

"That's it, all right. The good Buddha knows it is. So get going and leave me to my work." He turned back to the shimmering blue sculpture, eyed it without pleasure.

"It isn't the world," Edric insisted. "The planet didn't make the song I heard, no planet did. It was a woman. Her song—no, her *voice* was so clear I could hear it in the Way despite the Silences. I heard that voice through the Silences."

"No woman can sing like that," Grater said. "Goodbye."

"I don't intend to leave until I find her."

Grater gave him a look. It was hard to tell what it might mean. "Then what'd you say your name was?"

"Edric."

"Then, Edric, you just look to your heart's content. But don't get in my way, by Horus, just don't get in my way."

"Won't you at least tell me who she is?"

"There isn't any such person. I'm the only one here, anyway. And all I want to do is my work."

"But—"

"Can you give me any kind of reason I'd be on a world like this except to be alone?"

Grater turned, not waiting for an answer, and walked off, leaving Edric alone with the shimmering blue work of art.

After several moments, Edric stepped up to the thing for a closer look. Cautiously he placed the palm of his hand on its surface. It throbbed and hummed beneath his touch, and offered a thin but interesting echo of the planet's world-song.

Yet it wasn't the song Edric had heard or anything like that song. He left the strange blue object floating there in the air and began his search.

It was not an interesting world. It was small by planetary standards and mostly barren. There was water in occasional streams and green things grew close by the water. But mostly there was stone and shale and jagged unfriendly mountains. The surface of the planet was wrinkled and pitted like a peachstone. There was no reason to think that the girl he had heard singing was hiding from him, but if she wanted to, this planet offered plenty of places she could be. But why would she want to?

It was like searching for a flame on the sun. He wandered and he stared, for the most part, at whatever was the horizon from where he was standing. On even a small world there were too many places where a person could be at any given time. She had no reason to be

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hidden, but that didn't mean he'd necessarily find her.

But on he walked, wandering and searching. He was afraid, those first few days, to slip back to the concourse where he had first heard the song, afraid of the Silences. Gradually his nerve was returning, though, and after several days he slipped back into the Way and stood, poised, just off the small lonely planet. He listened.

He heard.

Songs. Thousands of them, more than he could keep track of. Wind chime and trumpet, string and bell, mallet on iron. The rush of water, the swift movement of stormwinds, a fall of rock, whistles, ringings, crystal sounds, and sounds unlike anything but the sounds that planets make. Songs, thousands of songs. All at once, from thousands of places, some of them close, some of them far, all of them singing, singing. The Silences had passed on.

He stayed where he was until he could make out the humming sound of the lonely world. And he realized he had been mistaken about that, that it was not such a lonely world after all: perhaps two dozen of the songs he heard were strong enough to suggest other worlds in the same star system. But when Edric was certain he could clearly hear the faint and timid song of Grater's World he started walking.

He used the humming planetsong as a beacon to keep himself oriented as he circled the world. It would have taken years on foot but he did it in minutes through the Way.

Though he heard more songs than he could hope to recall later, he didn't hear the one he wanted. He circled the planet once again before stepping out on the nightside.

For a long time he sat on a boulder and brooded.

He was human and in the human way, his imagination drifted. His mind conjured up ghosts and superstitions, answers to the mystery. He invented a Siren of the Silences. A beacon for lost Terrans. The Lost Woman of the Silences. He thought of wood nymphs and wondered if his secret singer could, in some supernatural fashion, live in a rock such as the one he sat on. He imagined that she might be invisible, that she might be deliberately hiding from him, watching him from the shadows, laughing at his efforts and his failure. But all along he knew the answer was simply that she hadn't been singing. And the answer might even be that she had simply left this world last night and gone elsewhere, in which case he might never find her again.

He should move on himself. Only—suppose she was here? He wanted to hear her sing again, he wanted to see her.

After a time he gave up his brooding long enough to sleep. The next day he searched some more, with identical luck. Finally, late that day, he found himself at the same place where he had first set foot on this world.

So he went to find Grater.

"So you're still here, are you?" Grater greeted him. He was seated on a rock outside the mouth of a great cavern. It was dark inside the cave, but Edric could see small shimmering points of colored light somewhere deep in there.

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"I didn't find what I was looking for," Edric said.

"Why should you? Why should anybody, ever?"

"I feel like looking, that's all," Edric said. He hated himself for defensiveness, but added, "After a time, maybe then I'll give up."

"Mary of the Almond," Grater said. His voice was surprisingly soft, though. "Don't you know by now you won't give up? Just look at yourself. If it isn't this one damned song, it'll be another one. You're hopeless."

"I just want to see her."

"Why?"

"I don't know. I just do."

"Sure." For a moment he was silent, they both were, but then Grater spoke up suddenly. "What do you know about it? Feet of Adonis, man, what can you know of it? I'm not blind. I can see what you are, even if you can't."

"I'm just somebody who heard a song and wants to see who sang it."

"But it isn't a worldsong, right? And it came to you while you were in the Silences, right?"

"Yes."

"And to you that sounds possible?"

"Well—"

"I thought so, it doesn't sound possible, not even to you. You given any thought to the possibility this is all in your mind? That the Silences made you imagine that song?"

That made Edric angry, but he had no answer for it.

"Well, I guess you're thinking of it now," Grater said.

Suddenly he stood up. "I want to show you something."

He went into the cavern without looking back. Edric hesitated only a moment before following him.

The entrance widened and sloped down toward what was evidently a vast chamber. There was light far below. There were sculptures.

The cavern blazed with color. Shimmering reds and blues and golds and yellows, blazing white and emerald green. And shades and gradations of those colors and more. Much more. Reds that were almost as dark as night. Scarlet and russet and crimson and so on to orange. Blues like earthsky. Blues like ocean water. Nightblue.

All the colors shimmered. Some of them were like types and qualities of glass, some like moving water, some like flames, others like bright gasses or tinted air. No two of them seemed to be the same.

Each was itself not only as to color, but as to shape, as well. Some were formed like things Edric knew, the figures of animals or trees or women. Some rested on the ground or seemed to grow out of it. Others—most in fact—floated above the ground; their levitation seemed a part of the design. There was one complex piece in the form of a dozen varicolored planets circling a blazing golden sun. Most of them were abstract, strange, shaped to Grater's whim. Yet Edric was aware how brilliantly each and every one of them was conceived.

"It's my song," Grater said curtly. "Listen to it. Go ahead, listen."

Edric could only gape.

There must have been a hundred of them. All of them as beautiful as they were strange. Now Edric understood.

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Songs, yes, like songs. But songs set to color and form. And strangely alive.

"I never thought there could be anything like this," he said.

"You never thought," Grater said.

"But why here? No one can see them here. People ought to know about these. They should see them."

"When it's right, they will," Grater said.

"But . . . look at them. I don't see how they could be more right than this. They're incredible."

"Not incredible enough. I've seen more incredible; I've seen better, much better." Grater tapped his forehead with two thin fingers. "Up here, there's better. You understand that?"

Edric hesitated. "I don't think so—"

"No, of course you don't. Yet. But you might in time, you might. How could I know what you might know in time?" He turned his back as if he didn't want Edric to see his face. Or maybe he wanted to stare at that small yellow abstract over in the far corner. Who could say? He kept talking. "The Way changes people in thousands of ways. All people. But some it changes more than others. And in special ways. You know that. Even you know that."

"Yeah, but I don't understand why you've hidden these things away where no one can see them."

"Two reasons, not that either one of them's any of your business. I told you one of them. They aren't ready to be seen; I haven't done what I want to show yet. The other is that I like it here, on a world like this. I don't like interruptions. I like a world that hums quietly rather than one that bongs like a Dionysius-be-damned bell every five seconds. I like the quiet."

"Yeah, I guess I understand that."

"Then guess again. What you understand is here I am talking like this to you and you tell yourself ha-ha this old bastard's so lonely for some company he'll say anything. He's talking merry-go-rounds around the real truth and what he means isn't what he's saying but what he isn't saying. You really think that, don't you. Don't you? You don't know at all."

"I'm sorry. But that's not—"

"You know how the Way affects people. Like they're able to walk on worlds where the air should boil your insides out or the gravity should flatten you to a fine coating of salve? Sometimes the changes go deeper than that, Edric. Look—"

Grater reached an empty hand up into the air.

It was like a conjurer's sleight-of-hand trick, an illusion for your eleventh birthday party. But it was no coin or card that Grater plucked from the air, not two small balls he held between his fingers. It was like a handful of clay, but it was the color and clarity of pale honey and it shimmered and was alive with its own light.

And Grater reached into the air and gathered a second handful and joined it to the first. Again he gathered honey-colored shimmering clay for his sculpture until he had a fair amount of it packed together and suspended in the air in front of him.

"You can't do that," Grater said.

When he could find his voice, Edric said, "No."

"No one can, but me. It was what

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happened to me from walking the Way. I don't know how or why—if there is any such thing as a 'why.' It was just a one-in-a-billion fluke, a bonus tossed in in addition to all the other ways, even the inner ways, that people are changed. I seem to be able to gather the stuff to build my sculptures from the basic fiber of the universe itself."

"No wonder these statues are so magnificent . . ."

Grater faced him again. He seemed almost on the verge of tears, but instead of sobs it was all coming out of him in rage. "Magnificent, yes! No one's ever done anything like that, not Cellini, not Michaelangelo, not Rodin, not Sarretto, not anyone but me. Look at it, just look. Sure, it's great. But not my part of it. It's what I've worked with that's great. I've added nothing to the clay. None of the shapes are worthy of the stuff they're built of."

There was a moment where neither spoke, not as deep a silence as the Silences, but somehow more profound. All Edric could think of to break it was, "I'm sorry."

"Just get out of here. Winds of Azazel, just get out of here."

Grater stood unmoving. Edric wondered if there was anything he could do for him. After a few moments, he realized there wasn't. He left the cave and sat down on the stone shelf just outside the entrance.

After a time, Grater came out and sat down on the other side of the opening. They spent the rest of the night without speaking.

This was a world where morning came weakly. But the distant sun rose and the mountainside was bathed in first light of a fashion. Edric woke, surprised to find that he had been asleep. He saw Grater standing, staring down into the small valley below the mountain. There was grass, after this planet's fashion of grass, and small trees only a bit larger than bushes.

Grater said, "Made up your mind what to do?"

"Not really. I guess I'll go. Be stupid to do otherwise."

Grater turned, looking so pale in that daylight that Edric found himself wondering if he had managed to sleep. "Is it?" Grater asked.

"Is it what?"

"Stupid to continue looking."

"Isn't it?"

"That's up to you," Grater said. He looked back at the valley. "Lots of things up to a man if he'd only think about it. If he'd only face it. But you don't really want that sort of responsibility, do you?"

"What's responsibility got to do with it?"

"If you ever talk to yourself, I'll bet it's like two strangers that don't speak the same language. You're like me. Like I was. In a while you'll be just like you see me now. And I don't mean standing here all by yourself doing statues that aren't good enough to satisfy yourself. Tell me, Edric. You're no minstrel and you're no artist. I don't think you're a wordsmith. Just what are you?"

"Do I have to be something? I'm just me. That seems enough." A pause. "I just like to search things out."

"Sure," Grater said, drily.

Edric got to his feet. "Anyway, I've

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made my mind up now. Going's the best thing."

"What . . . ?"

"I said—"

"Hold it. Shut up!" Grater snapped. He had a strange look. "Listen. Don't—"

Then Edric heard it. The song. He turned, stared down into the valley. She was standing at the valley's mouth.

She wasn't close enough to see well. He had a glimpse of blue-gray dress, of long blonde hair, of straight flashing arms and legs. But the song crossed the distance to him. It was strong, clear. Easy to hear.

He listened. He dared not call out even to attract the woman's attention. Beside him, Grater listened.

Then she was gone.

With a lithe movement she opened space and stepped off Grater's World into the Way. She had not looked toward the men, could not know that anyone had been listening. She simply left.

The song went with her.

Edric stood staring at the emptiness where she had been. Her song echoed in his mind.

He turned. Grater dropped to a sitting position on the ground. "Jesus," Grater said. "Sweet Jesus."

"She's real," Edric said. "I know that now. I can find her, if I look. By her song. Anyone who ever heard her sing would remember."

"There's a lot of songs between her and you by now," Grater said.

"But I know she's real now. I know she can be found. I have to try."

Grater knew that too. He nodded.

Edric stepped off Grater's World and left Grater staring at the emptiness

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where he had been. Grater wasn't sure whether to envy or pity him, but that wasn't important. Things like that had never been important.

Grater stood up.

He went into the cave and looked around at the works that filled the great chamber. How many years? How much effort did these things represent? He couldn't say. But did things like time or effort matter? Not when they weren't right. He took five minutes and rejected one. It was his own satisfaction he sought, wasn't it? Of this, wouldn't he be sure in spite of years, in spite of what he had put of himself into these?

He had heard the woman's song, heard it and understood, had known why she was here. Understood how she had been changed and how she had perfected what she could mold from the clay given to her. God, that song of hers rivaled the worldsongs—

His statues—

His statues. He grabbed the closest one and sent it hurtling into another.

He willed them apart. He tore them with his hands. All of them, the statues, close to a hundred of them, he'd shaped out of the fabric of space itself as only he could do, he who had the responsibility but not the talent. He rent them and set the shimmering colored energy of them free, like gas out of a balloon.

Colors rolled across the ceiling of the cavern. They rolled across the ceiling and up to the cave mouth and out into the sky, where they burst like ecstatic fireworks, all red and green and gold, silver and yellow and blue. The sky crackled with a display of rockets and roman candles such as no man had ever seen in all of time and never would have the opportunity to see again. But Grater stayed in the cavern and cursed himself until the last of the works was spent, so there was no one to watch what was in the sky.

It was a week that Grater brooded and dreamed and thought of going back to the worlds of men. It had been ages since he walked the Way, but that's not a thing a human forgets how to do.

But that wasn't all he couldn't forget.

When his brooding was finished, Grater put it and the thoughts of leaving aside and went back into the cave.

In the way that only he could, he took hands full of shimmering, colored material and molded a statue. He worked with an intensity he had never known before. When he was done, it was not what he knew it should be, but it was better than any he had ever done before. The next one was very good indeed. ■

I view science fiction as a treasury of models—models of alternative political and social systems, sexual relationships, forms of technology, and so on. The more alternative models of which we are aware, the more flexible our responses can be to present-day situations.

Alvin Toffler

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ON GAMING

Dana Lombardy

You're probably familiar with the literary awards given each year to notable new works in the categories of novel, novelette, short story, etc. The most publicized of these awards are the Hugos and Nebulas.

The Hugo Awards (formal title: the Science Fiction Achievement Awards) are named after Hugo Gernsback, called "the father of (American) science fiction." The Hugos have been voted on and awarded by members of the annual World SF Convention since 1953.

The Nebula Awards have been given annually by the 400-plus membership of the SF Writers of America since 1966, therefore differing from the Hugos in that they are voted on by the writers' peers.

Other awards include: the Gandalf Award, given since 1974 by the World SF Convention in conjunction with the Hugo Awards and presented in recognition of contributions to fantasy as a "Grand Master" award; the World Fantasy Awards, given annually since 1975 by the World Fantasy Convention; the British Fantasy Awards, given each year since 1972 by the British Fantasy Society at their Fantasy Con; and the Jupiter Awards, inaugurated in 1973 by the Instructors of Science Fiction in Higher Education at the University of Maine and administered by the Science Fiction Research Association, which acts as a central liaison for academics teaching SF in America.

(You can obtain the interesting background history and list of winners in the paperback *A History of the Hugo, Nebula and International Fantasy Awards* by Franson and DeVore for $5 from Howard DeVore, 4705 Weddel St., Dearborn, MI 48125. Updates are provided each year.

Games also have their awards, and SF and fantasy designs have earned their fair share of accolades. The three most publicized American game awards are the H.G. Wells, Charles Roberts, and Game Designers' Guild.

The H.G. Wells Awards, given annually since 1978, are so named because the famous SF author is credited with starting the hobby of wargaming with toy soldiers. Wells's book *Little Wars* (1913) was the first set of formalized rules for creating battles in miniature. Appropriately, the H.G. Wells signifies outstanding achievement in gaming miniatures or role-playing games.

Charles Roberts found The Avalon Hill Game Company of Baltimore, Maryland. This was the first firm in America to produce a line of adult-level wargames based on historical battles. Since almost every adventure game designer and publisher can trace his roots to Avalon Hill, Charles Roberts has been honored with his name on the awards, which signify outstanding achievement in board games. They have been presented each year since 1975.

The Game Designers' Guild, an organization of about 100 professionals, has given its Select Awards annually

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since 1978. These are similar to the Nebulas in intent and purpose.

The GDG Select Awards are not given in specific categories. Rather, members vote (by mail) for what they feel were the top five designs of the previous year. The five with the most votes receive the Select Awards. No one type of game dominates; SF games have been chosen among the top five every year.

There are currently eighteen categories for the H.G. Wells and Charles Roberts awards. Eight are for SF or fantasy miniatures/designs. Nominations may be mailed in by *anyone* interested enough to fill out the nominations form that appears in every gaming magazine. The top three nominated in each category are then voted upon by the members of the Academy of Adventure Gaming Arts & Design, an organization of professionals and serious amateurs. Winners are announced each July at the Origins game convention.

Below is a list of winners of these various game awards in the SF and fantasy categories. Next time we'll take a closer look at the games and the elements that have earned them such recognition.

Charles Roberts Awards

(There were no categories for SF or fantasy games from 1975 to 1977.)

1978 Best Fantasy Board Game: *War of the Ring* by Simulations Publications Inc.

1979 Best Fantasy/SF Game: *Mayday* by Game Designers' Workshop.

1980 Best Fantasy/SF Game: *The Creature That Ate Sheboygan* by Simulations Publications Inc.

1981 Best Fantasy/SF Game: *Azhanti High Lightning* by Game Designers' Workshop.

Best Computer Game: *Temple of Apshai* (fantasy adventure game) by Epyx/Automated Simulations.

1982 Best SF Board Game: *Car Wars* by Steve Jackson Games.

Best Fantasy Board Game: *Barbarian Prince* by Heritage USA Inc.

H.G. Wells Awards

1978 Best Fantasy Figure Series: 25mm figures by Ral Partha Enterprises Inc.

All-Time Best Role-Playing Rules: *Dungeons & Dragons* ® by TSR Hobbies Inc.

Special Award for Greatest Contribution to the Hobby from 1967-1977, and also winner of Hall of Fame: *Dungeons & Dragons*® by TSR Hobbies Inc.

1979 Best Fantasy/SF Figures Series: *Fantasy Collector Series* by Ral Partha Enterprises Inc.

1980 Best Fantasy/SF Figure Series: *Collectibles* by Ral Partha Enterprises Inc.

Best Role-Playing Adventure: *Kinunir* by Game Designers' Workshop.

1981 Best Fantasy/SF Figure Series: *Personalities* by Ral Partha Enterprises Inc.

Best Role-Playing Rules: *Dragon-Quest* by Simulations Publications Inc.

Best Role-Playing Adventure: *Twilight's Peak* by Game Designers' Workshop.

1982 Best Fantasy/SF Figure Series: *Traveller*® and *Dragonslayers* by Martian Metals.

Best Role-Playing Rules: *Call of Cthulhu* by Chaosium Inc.

(Continued on page 173)

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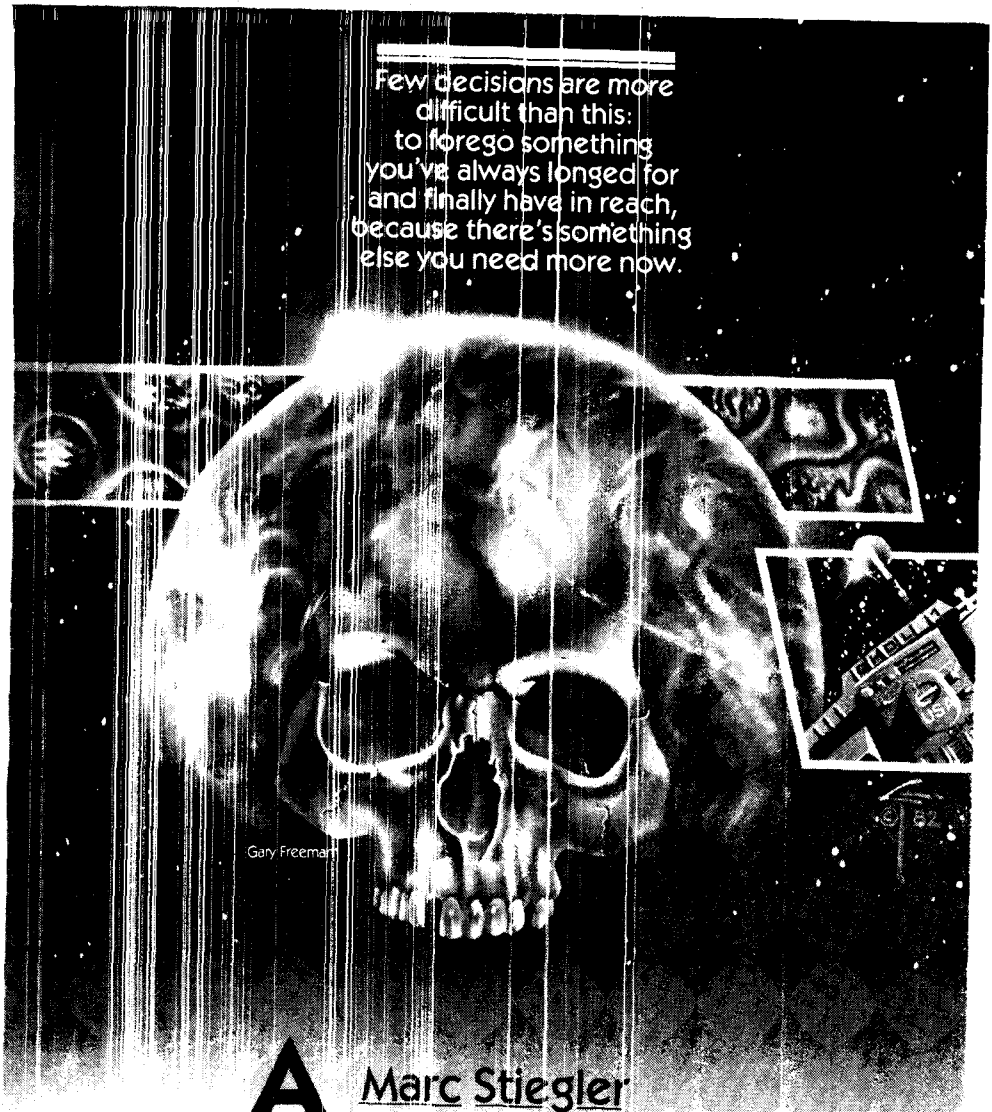

Marc Stiegler

A SIMPLE CASE OF SUICIDE

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It was hot in Washington, and muggy, as usual. Why did the air conditioning have to break down today, of all days?

It did not matter. With a last deep breath—and a brief, hacking cough —Max nodded to the Secret Service agent.

The agent opened the door, and Max stepped swiftly through the crowded rows and rows of seats. He paused as he came to the podium, to look once more at the Presidential Seal affixed to the lectern. *Will I ever get over the awe of looking at these symbols of power?* he wondered. He smiled, grimly. *No: if I haven't gotten over them yet, I never will.* Determination renewed, he climbed the two short steps and turned to survey his audience.

One of the camera crews was waving frantically to tell him to wait. He nodded to them. His eye wandered over his prepared notes. They were pointless, of course. He had spent the night dreaming of the words he would say today; over and over they haunted him. He shuffled the papers, putting them aside on the lectern, except for one. The important one.

He gazed at it, and was pleased that his hand held it steadily. *I must convey a sense of importance and destiny as no man before,* he realized again. *For the message I give must ring in their ears for decades.*

It will be, he realized again, *my last, my greatest, act—of betrayal.*

He made no excuses for it in his own mind; he would betray millions of people today, as he had already betrayed everyone whose life had ever come too close to his. His wife, his son, his mother, his father, his best friend, his only hero—he had betrayed them all, sooner or later. They were gone now except, perhaps, for their ghosts.

Yes, he could feel their ghosts there now, looking over his shoulder at the paper, watching him watch the crowd. . .

"You've got to be *crazy* to keep on going back to school every year," Max's younger cousin said. She seemed quite childlike to Max; Max, after all, was already 25.

Max shrugged, lying on the couch, deep in the middle of a well-worn spy novel. "There are worse things in the world than going to grad school."

"Oh yeah?"

"Sure. Getting a job, for example."

The squeaking from his father's room subsided. A loud "Whew" sounded from the same direction.

"He's done with his exercise bicycle," Janet mumbled ominously.

The sound of an elephant stampede thundered down the hall and broke into the living room. "I just went three miles farther than ever before," Max's father bellowed triumphantly.

"Um-hm," Max replied.

Max caught a glimpse of a falling object, and he heard a loud thump as his father slipped suddenly and fell down. Max looked up from his book with a slight smirk. "You all right?"

His father was spread-eagled on the floor, gasping, sputtering, and gulping air. His eyes bulged.

"Dad?" It took Max and Janet several seconds to realize that something was really wrong. Max reacted first. "Dad!" He jumped to his father's side. Janet screamed.

Max knelt over his father. Still he

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gasped for air, yet his face was turning blue at the same time. "What's wrong?"

His father didn't respond.

Janet yelled again. "What's wrong?"

Max didn't look up. "Call the ambulance."

The gasping was dying down. Max brought his hands up, moved them toward his father's chest; he had had CPR training two years before, he had learned what to do.

But that CPR had been two years ago. He had forgotten what to do. His hands were shaking; he couldn't believe this was really happening; his blood was pounding in his head, screaming *Do something! Do something!*

He put his hands on his father's chest—*but he couldn't remember what to do.*

The bluish tinge in his father's face deepened, turning grayish.

He died as Max knelt there, trying to remember how to save his life.

A few days later, an old friend called him, an old friend who was now a psychologist.

"It's really not too surprising that I couldn't remember what to do," Max explained. "I just didn't expect it, for one thing, right out of the blue like that. And CPR training only lasts a year—you've got to take a refresher every year to stay qualified."

"But still you blame yourself." Joe was probably a terrific psychologist, Max realized. He was so calm and steady as he directed the therapy; that was what Joe had called to give him, though Max was sure Joe would never admit it.

Max considered the matter for a moment: did he blame himself for his father's death? His first instinct was to just deny any guilt feelings because he didn't believe in feeling guilty. But he realized that he wouldn't be kidding anybody, not even himself. "Yes, I blame myself."

"But surely you see that there's no reason to blame yourself."

"You're right, Joe. But . . ." and his voice started to tremble. "*Joe, I was so close. I almost* could have saved his life." He shrugged, though Joe could not see. "Don't worry, Joe. I'm not suicidal or obsessed by it. I'm just guilt-ridden. I probably always will be."

Yes, the ghosts were there, looking over his shoulder at the millions and billions of lives that Max held in the paper in his hands. Max was so *close* to saving their lives. But he didn't dare.

The cameraman nodded to him.

Dry as his throat had been, now it was drier still. He smiled nevertheless. *Dry throat? Tough. This speech is gonna get a lot harder before it gets easier.* He breathed deeply.

"People of America," his voice rang with pride. "People of the World," he said more softly. Max hadn't been sure whether he should include them or not, but finally he decided he had to. After all, they listened today, too; they knew his decision had profound consequences for them as well as for America.

It was so important, that today even Tina would be watching. Even Steve.

It was dry, sunny, and not too hot for once, standing on the edge of the lake. No doubt the coolness was caused by the breeze that now blew sand in his face. Max turned away from the glare

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and the sand. Steve strolled toward him, holding hands with a skinny girl in white shorts and a red halter. Steve waved at him; Max waved back.

Steve released her hand. "Tina, this is the guy who's been my roommate for the last six years, Maxwell Palmer. Max, this is Tina, the most beautiful woman in the world."

Max shook her hand. Close up, she no longer looked skinny, and her eyes were bright emerald green. Max was mesmerized. "The most beautiful girl in the world," he muttered. "I can well believe it," he said more clearly, with a touch of envy.

Tina frowned, smiled, blushed, and shook her head. "Not hardly. You're both crazy."

"Yeah," Steve said, "that's one of our problems. We're too much alike." Steve's eyes met Max's, and they shared a silent chuckle. "Where's Holly?" he asked Max.

Max sighed. "I dunno. Looks like she stood me up again." It hurt, inside, but it wasn't the first time. Max could *stand it.*

"Oh, well." Steve shook his head. "Crud. Another one of my problems is that I can't remember a damn thing. Lunch is still in the car." He trotted back the way they'd come. "Be back in a flash," he yelled.

Max looked over at Tina, looked down at his feet, looked at Tina again. "Steve's a great guy."

"Yeah." After a long pause, Tina said, "So you're the other half of the grad student team that's gonna change the world."

Max laughed. "At least we're gonna try. You can't change it if you don't make the attempt, can you?"

Tina shrugged. "I guess not." For the first time, they looked each other in the eye. Both looked away.

Tina brushed back her hair nervously; it fell limply around her shoulders. "What's your family constellation?"

"My what?" Max asked.

"Your family constellation. I just read a book about that. You know, are you the oldest, youngest, or middle child in your family, things like that."

"Oh. Am I oldest or youngest? The answer is yes." So much for being infatuated with Steve's new girl friend. She was beautiful, but if she believed in dumb stuff like that . . . It was just as well that she wasn't too perfect. Steve's and Max's tastes in women ran too close together most of the time, anyway. "I am the oldest, and the youngest, and the middle."

"What?" She frowned, not understanding the joke. "Oh—you're an only child. That's a shame. You'll have a lot of trouble when you get married, then."

Max snorted.

"No, it's true."

"Even the claims like that that *are* true are only *statistically* true, though. I'll bet they say eldest children shouldn't marry each other, right?"

"Right. They'll both try to dominate the marriage."

"Aha. But my mother and father were both eldest children, and their marriage worked perfectly."

"I see." She'd caught the use of the past tense, but misinterpreted it. "*Worked* perfectly?"

Max looked away. "They died."

"Oh. I'm sorry." She blushed, then

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hurried on. "Goodness. An only child reared by two eldest children. Tell me, do you feel, uh, *parental* feelings a lot? A need to help people?" Max looked puzzled, and Tina continued. "You grew up as the focus of a lot of intense caring, right?"

Max nodded. "I suppose so." He gave a short, loud laugh. "Actually, it was even worse than that. My father's father ran out when Dad was 17, so Dad had been surrogate father for his brothers before getting married. And my mother's mother died when Mom was 18, so Mom was surrogate mother for her sister. I suppose I'm the quintessence of Parenthood, the distillation of a super-mother and a super-father."

"Yes." Tina raised her eyebrow. "If you're really the quintessence of Parenthood, then who is your Child?"

Max thought about it, and was disturbed to see the whole silly constellation business making sense. His voice held just a hint of awe. He quoted from a sign in his office. " 'The human race is a child, who must be protected until he is old enough not to hurt himself.' "

"What?"

"That's a sign on my office wall. It's one of my pet phrases, when I'm talking about war, and bombs, and starvation, and such. I've always been at least half-serious when I said it, too. I guess Mankind is my child."

"I see." Her words held deep understanding. At least Tina seemed to be trying to suggest that they held deep understanding.

Their eyes met, and held.

"Hey, would one of you statues help me with this stuff?" Steve Felman yelled across the sand.

* * *

"As you know, we are here to discuss life—and death." Max frowned slightly; his timing was a bit off in the delivery. Jason would have done it better. "As you know, our researchers have made a breakthrough in the integration of microprocessor technology and microbiology. A breakthrough that would permit us to cure all disease—not only the common cold, but cancer also—not only the common cancers, but the mutant II cancers as well." He looked confidently across the reporters and congressmen in his audience.

"No one ever need die of disease again." He knew it was true, with a certainty that few presidents ever feel. He knew it was true despite the screams of *hoax* by some grant-hungry researchers.

The cure was sure and clean. Maxwell Palmer knew it was good. Maxwell Palmer, after all, had conceived it.

Max tossed himself into the beanbag chair. "Barkeep, I need another drink." He waved his arm in the air at Steve Felman, his new roommate. Well, relatively new; they'd been sharing an apartment for two months now, and it was the best friendship Max had ever had, better than he'd ever thought possible. They could sense each other's mood without a word; sometimes Steve would come into the room while Max was stretched on the floor in deep depression, and put on an old record — and it was exactly the one song that Max needed to hear to shake the sorrow. Could he ever find a woman who understood his needs so perfectly? He suspected not.

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Steve chuckled. "So you need another drink, huh? Man, those robotics majors are real lushes."

"Ha! A biochemistry major should talk about lush. Who is it that consumes the most pure alcohol in the world? The biochemists. Not the robots, buster."

"Of course. Robots don't consume mass alcohol. Robots, like robotics majors, are much too prissy and sterile for that kind of thing."

"Ha! At least robots work for a living. What do biochemistry majors do? Collect unemployment and Social Security." Max coughed.

"Sounds to me like you need a biochem major right now, joker, to cure your flu."

"Ha! You guys can't even cure the common cold. What can we expect from you with *real* diseases?"

"Maybe I can't cure the common cold *yet*. But no robot *ever* will."

"Hold on there." Max thought about it for a minute. "You know, I'll bet we *could* use robots to cure the cold."

"Oh no. You've *already* had too much to drink."

"Wait a minute." Max sat up in the beanbag, not too successfully. "I can see it now: a robot the size of a germ, gobbling up viruses as fast as it can move."

"Great idea. Did you bring a few robots like that home with you?" Steve walked away from the bar, jumped headlong onto the couch.

"I'm serious."

Steve believed him. He rubbed his nose, staring at the ceiling. "How's the robot gonna recognize the viruses? You might, one of these centuries, make a robot the size of a germ, but where are you gonna put the brain power inside it to make it smart enough to recognize invaders?"

"We could datalink them to a big computer on the outside, let the number-cruncher do the thinking."

"I see. Okay, then, how're you gonna make enough of these things to make a difference? I mean, you're gonna have to have enough in your bloodstream so that you can destroy the viruses faster than they can reproduce, unless you're gonna make the robots reproduce too."

Max frowned. "That is a problem, I guess. You can't really make a robot reproduce inside your body. Not enough silicon."

"Among other things."

Max shrugged. "So, it'll be expensive." Steve looked at him with big, doubtful eyes. "Okay, it'll be *very* expensive. That's no sweat here in America, right? And we're the only ones likely to develop a robot that's that tiny anyway, anytime this century."

Steve rolled over and sat up. "Finally, smarty, even if your computer had the brains to figure out which were the good cells and which were bad, where would it get the education?"

Max snapped his fingers. "No sweat, man. That's where *you* come in. You biochem types teach it what it needs to know."

"I see. So there's a use for us biochem types after all." Steve mellowed at that admission. "Hmmmm. And haaaa. You know, that's not such a bad half-baked idea."

Max stood up; he was starting to get excited about the whole thing. "You know, I'll bet we could do it. The two

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of us." As he thought about it, his confidence grew. "They couldn't stop us!"

Steve stood up too. "You might be right. We could do this after we get our bachelor's degrees, when we go to grad school. It could be sort of a combined dissertation for robotics and biochemistry." He nodded his head. "I like it. You know, we could cure more than just the common cold."

"That's right. Nobody'd ever have to get sick again. From anything."

Steve walked over to the bar. "We might even be able to cure old age—I don't know how, maybe by having the robots clean up the free radicals or something. It might be worth investigating, anyway."

Max coughed again. "Right. *After* we cure the common cold."

Steve poured two short glasses of Glen Livet. "Are we gonna do this half-baked thing?"

"Yes."

"Swear to it?"

"Yes."

They solemnly shook hands on the pact. "A toast, then," Steve said, taking a glass.

Max raised the other glass. "To our dissertation!"

"To our dissertation!"

"What you may not know is that only American technology and American financing can bring the cure from a laboratory experiment to a product that saves lives."

He raised the piece of paper that Congress had put through the legislative process in just three short weeks, desperately rushing to complete the bill before the Congress recessed today. It had been an extraordinary effort, a master thrust, for they knew that this was the only chance they would ever have of getting it past the president who had fought it for so long.

Max waved the paper for the cameras. "I hold here the largest single procurement bill in the history of Man. I hold the key to the creation of paradise, the salvation of millions of people." He brought the piece of paper down between clenched fists. "I hold here the slaughter of billions of innocent victims, and the extinction of life on Earth." His hands trembled briefly; he was committed now.

"Have you ever seen someone die of cancer? I have. It is not a pretty thing, to die slowly, painfully."

Max walked very softly into the room, the sound of his steps masked by the moaning and occasional thrashing of the gaunt woman lying on the bed. "Mom?" he started.

She moaned and turned his way. She opened her sleepless eyes, that lay sunken in pits of shadow. "Max." She held out her hand—and screamed. "Sorry," she whimpered.

The cancer was eating her alive. For a time the pain killers had been quite effective, and she lived a normal life, at least as normal a life as one could live in a hospital bed.

But now the cancer had invaded her spinal cord, slowly working its way to her brain. It was no longer the pain sensors in her body that screamed in dying agony, but rather the central nerves themselves. The pain killers could no longer kill the pain; dosages strong enough to kill the pain would kill her,

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too. Though perhaps that wasn't a bad idea.

He talked to her. He told her about his summer job, and his preparations to start college in the fall. She listened, and moaned, and changed positions, and screamed. She screamed when she lay still, and she screamed when she moved, no matter where she moved, for the cancer followed her to each new position.

Finally it was time to go. Max stood up uncertainly. "I'll be seeing ya, Mom." He started automatically to say "Keep smiling"—it was Max's way of saying farewell—but he choked it off.

His mother smiled at him—it was a hideous caricature of a smile, for the lines of pain stamped her face with indelible creases—but it was her best effort nevertheless. "Keep smiling," she said.

Max stood there in agony, seeing her pain. "You too," he blurted as he hurried out of the room.

He never told anyone to keep smiling again.

"Cancer is a hideous disease, more terrible than any other disease we have ever known." He looked down, then looked up again. His voice turned soft, and terrifying in its gentle pressure. "Have you ever seen a city die of radiation poisoning? It is not a pretty thing, to die slowly, painfully."

Max felt flustered as he considered the number of times he had tried to make people see that these two, death by disease and death by radiation, were related. God, how he wished he were Jason! His voice rose involuntarily; he couldn't control it.

"Can't you see what's wrong with saving millions of lives? Billions may die! Can't you see that we have too many people already trying to share this planet?"

"Politicians!" Max exploded. "What disgusting kinds of creatures. You say this guy is a *friend* of yours?"

"Come on." Tina tugged him down the sidewalk until they were by the gate of a low stone wall. Behind the wall elms drooped in the summer heat, though it was cooler now that the sun was sinking. "He's a neat person despite his occupation." Her eyes twinkled. "And he's sharp, too. I'll bet that before the evening's over, you'll have a different opinion."

"About a *politician?* Not hardly."

"You'll have a different opinion about something. I don't know what, but Jason always . . . People are always just a little bit different after talking to him."

"No doubt he uses mind drugs."

"What an excellent idea!" a voice from somewhere among the elms cried. "Mind drugs! Tell me, do you have any recommendations? I've always believed in softening people up first, particularly if they hate—" and now the voice changed to mimic Max's—"*politicians.*"

Max peered into the shadows, and saw nothing until somebody tapped him on the shoulder. He jumped around.

"Hi. I'm Jason. Jay to my friends, except when they're angry at me." A small, pale man with dark eyes and black hair offered his hand.

"I'm Max." They shook hands.

"Hi, Jay." Tina hugged him, and

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Max felt a twinge of jealously. Not that *he* had any right to be jealous. Tina was Steve's girl; at least she had been when Steve left for the summer. Though now, Max wasn't so sure. Whom did she love: Steve? Or Max? Max was uncomfortable with the question; he knew he wanted her himself, desperately; but Steve had met her first. In Max's code of ethics, she belonged to Steve.

Tina had him by the arm again. "Come on, dopey. Didn't you hear what he said?"

Max blinked.

"If we don't get inside soon, the bugs will climb out of the trees and eat us alive." She pulled him along.

They sat down at the kitchen table: a long, beautifully carved table steeped in the smells of food and the echoes of loud laughter and deep discussions. It was a place of home.

Max sat at the corner, with Jason at the head of the table next to him, leaning forward, his dark eyes alive with energy, somehow not conflicting with his soft smile. "So you don't like politicians."

"Well," Max suppressed a blush, then decided he might as well be honest, "not really. Not at all."

"Why?" His tone was sharp, though friendly.

Max shrugged. "Look at all the stupid things they do." He sat forward himself. "Like wars, and arms races, and burglary—"

"Burglary?"

"Yeah, stealing money from one person to give it to another—usually to give it to another bureaucrat."

"Like in the social safety net system?"

"Yeah."

Jason nodded. "It's not an easy problem. Surely you can see that it's hard for a politician to fight Social Security—there are a lot of people who want it kept alive, no matter how much it costs, because it's benefitting them. And every year there are more people it benefits, and more voters who would hang anybody who tried to stop it."

"And there's fewer people to pay for it." Max had been furious that summer when he got his first pay check, to find that almost half his pay had been taken out before he even got it. "Everybody knows it'll destroy us eventually. Even the politicians. And they *know* that the longer they wait the harder it'll be to stop. If they were any good, they'd risk their jobs *now*, before it's too late."

Jason stroked his chin. "Ah. What *you* want isn't a politician. What you want is a statesman."

Max stared at him blankly.

"A politician is a man who can get voted into office. A statesman is somebody who, once into office, can make wise decisions. The two have very little in common."

"Then which one are you?" Max smiled wickedly.

Jason looked away from Max's face. "I'm not quite sure. Right now I'm running for the House. I suppose I'm a politician." He looked back at Max, and his smile returned. "Of course, I *plan* to be a statesman once I get there."

"Ha! Not a chance." Max loved to be cynical, particularly when he was justified.

"That is unjustified cynicism," Jason countered, as if he were a mind reader. "Being expedient from time to

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time doesn't prove you're completely immoral all the time. Haven't you ever done something you knew was stupid, just to please your advisor, in effect buying his vote?"

"Well . . ." Dammit! Of course he had. But—

"Besides, there have been some who became statesmen, you know—or do you think Thomas Jefferson and Abe Lincoln were men without principles, the way you seem to think all politicians are?" He raised an eyebrow. "Actually, there's no way you can tell whether I can do it until I've actually been tested. Or don't you believe in the experimental method?"

Max almost choked. "Of course I believe in it."

"Then how can you make such silly claims?" Jason's smile broadened. "Better yet, what are *you* are doing that is so much more meaningful and worthwhile than what *I'm* doing?" His eyes picked up the laughter in his smile. "I hear you're supposed to be protecting the human race while it's growing up."

Max ran his hands down the arms of the chair. "Oh, not quite." His voice turned a bit smug. "I *am* working on saving millions of lives, which is almost as good. We might even achieve immortality."

"Oh, really? Are you sure that saving lives and making them immortal is the right thing to do for humanity right now?"

Max stared blankly at Jason yet again. "What do you mean?"

Jason seemed surprised by Max's incomprehension. "Isn't it obvious? There are eight billion people crowded together here already. You're talking about increasing the number of people, increasing the burden on the planet's resources, reducing the amount of resources per person." He slapped his hand palm up on the table. "Man, some of the people you'll be saving are going to burn gasoline that *you* could have burned, put smog in the air *you'll* have to breathe, and increase the price of the food *you* buy. For some people, it'll make the difference between buying enough, and not enough."

"Wait a minute."

"In fact, the group you'll have the most impact on is the older, more disease-prone part of the population—the ones using the safety net—the ones you were just moaning about. What'll it do to your taxes if they keep on living?" Jason shrugged his shoulders. "Course, *you'll* be rich and famous, after inventing the cure. It won't be a problem for you—you'll be a member of the rich, protected class. It'll just be a problem for people like me, who're trying to stop the problem."

Max found his jaw hanging open; slowly he closed it.

There was a science magazine lying to one side; Jason stretched for it, couldn't reach it. "Tina, could you get that for me?"

Tina retrieved the magazine for him.

"Thank you, my dear," Jason said. Again Max felt groundless jealously.

Jason flicked rapidly through the pages. "What about the new cancers they just isolated—or rather, the ones they just recognized as being different?"

"We'll be able to cure those, too, I'm pretty sure." Max was still dizzy from the rate at which the topic changed.

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Jason stopped on a page. "There it is. 'Though they have the same symptoms as the usual cancers, like lung cancer and melanoma, these mutant II cancers have three distinctive features: they are much more prevalent in the post-industrial societies, even considering lifespan biases; they have a peculiar binodal distribution, striking primarily young adults ages 18 to 25, and people just past the midlife crisis, ages 45 to 55; and they have a 99.9% mortality rate, being virtually immune to traditional therapies.'" Jason looked up at Max. "This disease just might save the world."

"What?" Max felt dizzy. Where'd this guy come from? Where was his mind going?

"Don't you see? By wiping out people when they hit retirement age, we can reduce the strain on our society caused by retirement. Better yet, by killing off the ones just getting out of high school and college, when they're entering their best breeding years, we can reduce the overall population."

"We don't have to reduce the population. The population is going down anyway."

Jason waved the objection away breezily. "Just a temporary fad, with this new-woman identity. In five years the population will start zooming up again. I just hope it doesn't grow so fast that it makes up for all the slow-growth years instantly."

"You can't be serious."

"Sure I can. Don't you see the danger? As the population grows, so does the probability that someone will pull the trigger on a nuclear holocaust. To go around curing all the diseases—to say *nothing* of passing out immortality like candy—would be crazy. It's a simple case of suicide."

"You're not serious." Max just couldn't believe him.

Jason leaned forward, looking Max steadily in the eye, still smiling. "Am I? Does it make a difference whether I'm serious or not?"

Did it make a difference? If his arguments were correct, shouldn't Max take them seriously, regardless of whether Jason took them seriously?

Tina pressed his hand. "I *told* you Jason would change your opinions."

Jason looked over at her. "And *you*, Tina, what have *you* been doing lately that you shouldn't have?"

The three of them argued long into the night, about many things. Somehow, Jason seemed invincible. Max had never seen anything like it; Max or Tina would box him into a corner with his newest, crazy opinion. But then he'd rush them with a flurry of new ideas, new points of view, and suddenly *they* were the ones caught in a corner.

Max *still* didn't know whether to take him seriously or not. But he started reading the papers, looking for proofs and justifications for his conviction that saving lives was still an honorable enterprise.

Unfortunately, hideously, he found that Jason had been wrong: it wouldn't take five years for the trend of falling population to reverse itself. By the end of the summer, the census takers were giving the sociologists shocking information that destroyed all the pet theories.

The population was rising again. The only things growing as fast as the pop-

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ulation were poverty and mutant II cancers.

"And we Americans 'share,' " he lingered over the euphemism with careful but heavy sarcasm, "more of this planet than most other people put together—a single American consumes as many resources as hundreds of people in Norafrica.

"*And everyone in the world knows it!* How many more cities like San Diego must we lose? How many more notable Americans must be stalked by terrorists before we see the connection?"

"My God. Have you told Tina yet?" Max sat motionless in the chair."

"No, Mr. President."

Max squirmed; he wasn't used to the title, though he had borne it for a year now.

"We left it for you to tell her."

"Of course." Max turned in his chair, then looked back at the Secret Service agent. "I would like to speak to the wives of the four men who died, Bill," he said to the Secret Service agent.

"Very well, Mr. President." The Secret Service agent bowed and left.

Max held his head in his hands and screamed softly. His son—*their* son — had been kidnapped in a bloody struggle. Why did people do these inhuman things?

The story was already breaking in the newspapers; it was hard to stop a leak when half the people in Washington heard or saw the fighting. Max didn't want to tell Tina until he found out why it had happened.

He didn't have to wait too long. Within the hour they received a package at the White House. And the package contained . . . He went to tell Tina.

He held her and he told her; she was rigid as a statue. "It's a normal list of demands: two million dollars cash, the release of the five SALO prisoners we took in September, a planeful of guns and ammunition."

"Can't we give it to them?" She pleaded, but she knew the answer.

"If we do, they'll never let an American president alone again. Hideous as this is, it'll only get worse if we don't stop them now. You know that, don't you?"

Tina sobbed; her whole body shook. "Do we know these are really the people who kidnapped him—the same ones who blew up San Diego?"

Max's stomach rose in his throat. "Oh God. Yes, we know it's them, Tina." He couldn't open his mouth, much less talk, but he had to tell her. He had to tell her. "They included proof in the package. They . . . they sent back . . . Mike's right index finger."

Her eyes bulged; she screamed; Max held her as tightly as he could.

"I can't help him, Tina." He was crying. "But we'll kill them for it, if I have to do it myself. I'll resign when it's over, we'll get a house in the Rockies. I'm sorry."

Max tried to keep his promise; he did keep the first part. He gave the terrorists their five comrades, and their money, and a planeful of ammunition, and the SALO terrorists took Mike on board and headed for Bolivia, and Max signed the strike orders that sent three Firechargers to intercept, and they obliterated the plane and burned the money and killed

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the five freed prisoners and the twelve terrorists.

And killed Mike. At least, that was a possibility; no one knew for sure whether Mike was still alive by then.

Max did not keep the second half of his promise. He did not resign. In fact, the incident gave him a power in international politics unmatched in modern times: only a madman would order his own son killed. Oddly enough, the world respected madmen.

Max read the note Tina had left for the hundredth time.

Dear Max,

I know you believe you did the right thing. Perhaps I do too. I don't know. But . . . I just can't bear to live with the man who killed our son. I'm sorry. I love you.

He couldn't blame her. He couldn't live with the man who had killed their son either, but he had less choice.

Had he killed their son? Part of his psyche railed against the notion: it was the SALO terrorists who were responsible, dammit!

What does it mean to be responsible for something? Max could remember Jay asking. Max remembered his conclusion on the matter after Jason had forced him to think deeply about it years ago. *Responsibility is shared by all those who have the knowledge and the power to prevent an event, but who let it—or make it—happen anyway.* The SALO terrorists were responsible, even more responsible than he was, because it would have been easier for them to make decisions that saved his son's life. But Max was responsible, too. He accepted it.

He found he could not resign, to leave the world to forge its own solutions to its problems; he was responsible for that, too, now. He accepted it.

"We, the people of America, are consuming this planet!" He was starting to shake; he slowly straightened his shoulders, as Jason had taught him. He stepped back to the lectern (he had stepped away toward the audience at some point in his speech) and was calm. "Each day there are incidents that could lead to the holocaust. Each month we escape Final Confrontation by even narrower margins."

"Mr. President, they're heading for Vladivostok. We won't be able to reach them in time. They're only minutes from Russian waters, and it looks like half the Soviet Air Force is loitering around the area, just in case they need help."

"Very well, General. Keep me posted."

Max leaned back in his chair and shuddered. It was just another ordinary crisis. Another ordinary chance for the world to end.

He could order a GHOL strike now. The enemy commandoes would be dead, and the world would once again receive notice that murder of the innocent leads to murder of the murderers as well.

But it would set a new and terrible precedent, the precedent Max had fought against setting since his first inauguration. He couldn't use the GHOL, the Ground-attack Heavy Orbital gamma ray Laser, to settle ordinary crises. Otherwise it would be used each time a crisis arose, each time with a little bit less circumspection, until . . .

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He knew what he had to do. His stomach flip-flopped as he thought about it, but he knew he had to do it.

He turned to the hot line. He called Kiril Perstev.

The premier appeared on the visiphone. "Good day, Mr. President," he said in perfect English. He smiled. "I presume you think you have a problem."

Max's heart pounded in fear. Kiril was too good; he was the closest match to Jason he had ever met, fluent in many languages, with many points of view that he could shift into and out of with lightning speed. He was for Russia what Jason should have been for America.

But Kiril's motivations were different. God, how Max wished he understood what motivated Kiril Perstev. "I don't have a problem, Premier. You do."

Kiril raised an eyebrow.

"Three hours ago, terrorists attacked Japan's two largest ocean harvesters. The terrorists slaughtered the crews and raced for safety. We, of course, have interceptors in hot pursuit."

"In what way is this a problem for me, Mr. President? To be sure, the Soviet Union regrets the loss of life, but we support the liberation movements throughout the world as well."

"These pirates seem to be heading for Vladivostok. It's as if they expected to find safe harbor there. Naturally, if they make it, it will be more difficult to punish them. We would probably have to use the GHOL to saturate the entire city with lethal radiation levels, to make sure that justice was served."

Kiril studied Max through the visiphone. "That would, of course, lead to the holocaust."

Of course it would. Though Kiril was currently the strongest member of the ruling troika, many issues had not yet been settled. For Kiril, a show of weakness, particularly because of a mistake, would be fatal. Kiril's only alternative would be massive retaliation.

Max clenched his fist under the table. The fear tasted bitter in his mouth. Yet he stared coolly back at Kiril. "Premier, the pirates are dead men. How many others shall die with them?"

Kiril leaned back, bringing his fingers together in a steeple. "You would not do it. It is not in your nature. You are philosophically incapable of ending the world." He smiled wolfishly. "In fact, I believe that if I pressed the buttons and destroyed the United States, you would decide not to retaliate, in order to protect the human race."

Max's heart leaped in his throat; still he smiled back at Kiril. "You have an interesting point. I concede. It is against my philosophy to destroy you, or to destroy humanity." He leaned forward, and whispered into the visiphone. "But Kiril, it is also against my philosophy to bluff. I'm not the kind of person who would bluff—someone might call it, and I would lose." His looked hardened further. "No, Kiril, I would not bluff. You face a contradiction: my philosophy permits me neither to threaten nor to carry out the threat. Yet I *have* threatened. Where have you erred in your reasoning, Kiril? Don't guess wrong here, Kiril: for if you guess wrong, you will lose everything."

Kiril laughed, a loud belly laugh; but as the laughter faded, and Max remained

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immobile, Kiril's smile went away. For a moment doubt flickered in his eyes, before his mask returned. "Any pirates who attempt to use our territorial waters as a sanctuary will naturally be disappointed. Such an incursion into our security would be dealt with instantly by our Navy and air forces: such pirates would have their ships destroyed, and survivors would be executed," he said tonelessly as he broke the connection.

Max sank back in his chair, completely drained. *How many more times will I get away with it,* he wondered.

His bluff had worked.

"Don't you see how dangerous it would be to let our population grow untempered?" A ghost whispered in Max's ear. "It would be a simple case of suicide."

Max shook his head, and for a moment he felt the burden he had carried so long dragging him down. "Lord knows I have tried to make the world ready for this cancer cure."

"You're wrong, Jason. There *is* a way mankind can survive!"

"Goodness, *you* certainly are certain of yourself. For a change," Jason responded with a smile. "Would you care to sit down before you destroy all my most cherished pessimistic theories?" Since becoming a member of Congress, Jason had mellowed just a bit. Actually, Max wasn't sure "mellowed" was the right word: Jason just didn't talk as fast as he once had. That might be put down to weariness. But Jay's eyes still held a feverish brightness: perhaps the slowing of his verbal attacks was a part of converting himself from a *politician* to a *statesman*.

Once he had Max seated at the kitchen table, Jason leaned forward in the old style, and his words speeded up. "So tell me about the solution to all our woes. How are we going to prevent the holocaust?"

"By reducing the population."

"Sounds wonderful, but not very implementable. Or do you come equipped with a mechanism for performing this miracle as well?"

"Sure. We'll start a birthright lottery, conducted by the UN. Every country will get so many 'places' in the lottery, and the particular couples who get to bear children will be chosen at random."

"A beautiful idea that has absolutely no chance of success. Right off the bat, I can see a problem—naturally, the leaders of all the countries will want preferential treatment. They want children too, after all, and they have the power." He stared at Max, puzzled. "Besides, why would any country be interested in paying attention to a lottery, anyway?"

"You mean, what carrot would I hold out to them?"

"Exactly."

"We'd offer medical assistance, education, and food to the countries that went along with it."

"Um. What incentive could we give Americans? The safety net already gives them those things."

Max felt exasperated; why was Jason *always against* ideas, never *for* them? "Actually, I was hoping you would supply some of the ideas for making this thing work yourself."

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Jason shook his head. "No matter how neat or clever a solution may be, Max, no matter how effective the idea might be if it could be put into action, you have to remember that a workable solution to a problem not only has to function within the physical laws of the universe, it also has to function within the social laws of dealing with people. Any kind of a birthright lottery will have to get *everyone* to agree to it. That just won't happen. What would we do with people who had illegal babies—what would we do with the illegal babies themselves? Do you figure on shooting them?" Jason waved his hand. "To be implementable, you have to have a solution that requires as few people as possible, and to make the people you want to use exchangeable, so that if the particular person you want to help you won't, you can go find somebody else to fulfill his part in the project."

Max took a deep breath. "Yeah, I knew all that, sort of. I just hoped that *you* might be able to fill in some of the gaps."

"I wish I could, Max." Jay shrugged. "But I don't know how. I'm not a superman." He smiled. "Not yet, anyway."

"Well, I have another idea." It still left a bad taste in his mouth, but the second idea would work. "We could start up a few conventional wars, and commit enough atrocities and slaughter enough people to bring the population back down again."

"Now that sounds more promising. You don't need anywhere near as many people to help you start a war as you need to end one. There is, of course, a problem—how do you guarantee the conventional war won't escalate into a holocaust?"

"By neutralizing the missiles. We'll build an ABM system."

Jason coughed politely. "I can't help thinking somebody's already working on that."

"I'm sure they are. But I wonder if they're aware of all the new stuff going on with lasers and molecular computers these days." He described the new generation of x-ray lasers being used in the labs, what they were used for, and how they might be used for other purposes. "Anyway, if we could put a few megawatt x-ray lasers—with the kind of precision we're getting in the labs—in the sky, we ought to be able to make nuclear attack pretty unlikely to succeed, don't you think?"

Jason looked at him strangely. "Perhaps you're right. They could very well have overlooked this possibility. I'll investigate it." He sat back in his chair and clasped his hands. For a moment the fever subsided from his expression; he was strictly serious. "You know, I'm currently holding discussions with the members of the House and the Senate on putting together a new group to . . . well, a group to be a think tank, more or less, but with no party biases, with only the congress to be loyal to. I know that that probably sounds as unimplementable as anything else we've discussed here, but I think I can do it." He nodded to himself, as if finally reaching a decision. "How would you like to be the boss?"

"Me?"

"Is there anyone else in the room? I'm going to need all the good people I can get."

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"But my work—"

"Your medical research is more dangerous to humanity's survival than any other work in the world today. All those weapon makers out there aren't anywhere near as dangerous as you and Steve are. We *already have* the weapons we need to destroy ourselves. It's people like *you* who'll create a reason for us to *use* them."

He lurched forward to the edge of his chair; his intensity was greater than ever before. "Come with me, Max, and help me make a world that will be ready for your cancer cure when it's finished. I'll warn you right now—I don't think we can do it. But I know for sure that it can't be done at all if nobody tries. I want us to try."

Max shook his head slowly. "I don't know. I'll think about it." He smiled. "Maybe, if you promise to try to make the birthright lottery idea work."

Jason smiled back. "I don't know. I'll think about it. Maybe, if you promise to come to work for me."

CLASSIFICATION:
TOP SECRET
AUTHORIZATION KEY:
SILENT CAMPER
ACCESS SUBKEY:
STEEPLE
NOTE TO GENERAL MAVERY ON THE DEVELOPMENT OF THE HIGH-ENERGY XRAY PLATFORM (HEXPLAT)

Work is progressing swiftly toward launch of a prototype platform. Current estimates suggest we will be able to identify, acquire, and kill individual missiles with 95% confidence at a rate of five targets per second per platform. This is equivalent to wiping out the entire Soviet ballistic force in three minutes with two HEXPLAT platforms.

"I have known for many years that this day would come, when the cure for mutant II cancers would be uncovered." Yes, he had known it would come, for he had known Steve would bring it, even without Max's help.

"We have to tell him, Max," Tina chided. "He's a good man; he can take it."

Max squeezed her hand. "I know he can. But, God, how I hate to do this to him. His whole world will be wiped out."

They came at last to the door of Max and Steve's apartment. They entered. Steve sat upon the couch, a guitar in his hands, softly singing melancholy songs. He glanced up as they opened the door. "Howdy," he said, interrupting himself.

"Hi, Steve." Max cleared his throat.

Steve looked back and forth between the two of them. "Is something wrong?"

Tina started forward, unlocking her hand from Max's; somehow, it was uncomfortable to hold hands in Steve's presence. "We've got a couple of announcements, Steve."

"I see." He put the guitar aside, and sat up, cross-legged. "So?"

Max took a deep breath. "First off, I'm moving out of the apartment." He took Tina in his arms. "We're getting married."

Steve turned away. "I see," he choked out. He turned back, blinking his eyes. "Well, I sorta knew this was

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coming anyway. It would be sorta hard to miss it, wouldn't it?"

Max didn't say anything. Sure, Steve had known, academically, that Max had won the girl they both loved, but only now did Steve feel it in his gut. *I almost wish it were the other way around,* Max thought. *I'd rather suffer myself than to have you, my best friend, suffer.*

"Well, at least I'll still see you every day on the project," Steve said, making a half-hearted effort at a joke. But both Max and Tina turned away when he said it. Steve's voice turned panicky. "We *will* still see each other on the project, won't we?"

Max covered his face with his hands. "No," he mumbled.

Steve stood up. "What did you say, Max?"

"I said . . . we won't see you on the project." He forced himself to speak clearly. "Steve, Jason offered me a job, a while ago. I—"

"Jason! That creep!" Steve stomped across the room. "You're not letting him tell you how to run your life, are you? Did you let his goddam willies infect you, about mankind's survival and all that bilge?" He held up his hands. "Not that we aren't in a lot of trouble, don't get me wrong. But Jason's so sure he knows *exactly* what the problems are and *exactly* what to do to solve them, and he's full of it! You see that, don't you?"

Max started to step back, then held his ground. "He's *not* full of it, and you know it."

"So you're just gonna walk out on six years of our lives, all the plans we made, all the *promises* we made?"

Max stared stonily into the distance. "I'm sorry, Steve. Yes. I'm just going to walk out."

Steve stepped back, too shocked to be angry. But the anger came back, a burning anger that flushed his whole complexion. "Then get out," he spat. "You think our project is dead, just because you're a traitor, but it's not. I don't care what you and Jason think of it. *Our idea is a good one.* I'll complete the work we started. I'll show you." He walked to the door. "I wish you'd never met Jason." He sobbed. "I wish I'd never introduced you to Tina."

"But people have shouted down every effort to make the world safer. The whole world ranted against the birthright lottery. All of America turned its back on the space program." Max choked with rage. "And the space program was the only program in the world that might have put people safely beyond the reach of the GHOL. But we destroyed it in the name of the safety net—never admitting that mankind's only true safety net is continued progress."

"Surely you can see that, over the long haul, the space program is the only thing that can save us." Max wanted to make it a plea, but he dared not show weakness in front of Senator Kelvane; that would be fatal.

Though it might to be fatal just to have to talk to the senator; Kelvane *knew* that he had won, if Max asked to see him personally.

Kelvane snorted. "You fellahs an' your long hauls," he said with the Southern drawl he was so proud of. "I've got enough trouble with today an'

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tomorrow." He jabbed a slim finger at Max; Max couldn't help thinking it ought to be a fat cigar with smoke pouring off, to match the classical image of a politician.

But it wasn't. Kelvane was a classical politician—not a statesman—but he was smooth, like fine bourbon.

"Y'all have a long haul of time to pay for your long-haul solutions. Now my constituency needs things they can see in their lifetimes."

"Senator, the space program budget is so trivial compared to the Social Security budget—destroying the space program will have absolutely no impact on the current budgetary problems."

Kelvane just shook his head. "Boy, it don't matter one bit whether it helps or not. It's the signal it makes that's important. Cutting off all the silly games lets the people see that we are making all the sacrifices we can to correct the problems."

Max had already lost; he let his fury take control. "You're killing the whole human race for the sake of a few voters!"

The senator smiled; it was still a smooth smile, but it was ugly. "Why, no, son. I'm killing *you* for the sake of *me*. Big difference there." The senator rose to go. "If you were Jason Masino, things might be different." Kelvane's eyes filled with a strange combination of feelings: a bit of fear, a deep awe, and a profound, even compassionate, concern. Somewhere, sometime, Jason had touched him.

But the touch was too long ago; the look faded, and the senator went for the throat. "But you aren't him. Not by a long shot."

Max hated him for a time, but that feeling faded, too; there were so many others like him it wasn't worth wasting the energy.

Eventually, of course, the future became the present, more swiftly for Senator Kelvane than for many. Kelvane was in San Diego when the SALO completed their crude, hand-made nuclear device. They lit it off in the hotel adjacent to the auditorium where Kelvane was speaking to the assembled governors. Kelvane's last moments were spent a hundred meters from ground zero of a twenty-four-kiloton explosion.

"The world is not yet ready for American medical technology; not even America is ready for the banishment of disease.

"But some day we will be ready. Some day we will have a defense against the GHOL. When it's impossible for us to kill ourselves on impulse, we will be able to save lives impulsively. But until then we must discipline ourselves, and hold the technology of even longer life in abeyance." Was that concept too sophisticated to be pitched to the American public—the idea that sometimes one technology dare not be brought to life *until after some other technology* arrived to solve the problems of the first? He prayed it was not; but he heard Jason's ghost laughing nevertheless.

Jason sipped a cup of coffee; as Jason said, coffee was his only vice, except for sugar cookies. "Tell me, Max, is there anything you would not do, anything you would not sacrifice, to guarantee Man's survival?"

Max finished buttering his toast and

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glanced at Jason. He knew he should think carefully before answering, but he thought he already *had* thought carefully. "I don't think so."

"I see. I asked, because we have a new problem."

Max's stomach tightened.

"They're building a new weapon, Max, that's impervious to the HEXPLAT."

"Who? How?"

Jason shook his head. "I don't know, Max. But somebody is."

"How do you know?"

"Because that's the way people are. There are millions of men employed in the world for the purpose of finding better ways to kill people. One of them will succeed."

Jason had fallen off the deep end this time. Max threw up his hands in exasperation. "So what are we supposed to do about it? We'll have to deal with it when the time comes."

"Can we afford to wait until the time comes, Max? How likely is it that Steve will complete his research?"

Max swelled with pride. "He'll do it, Jason. Just a few more years: he's licked all the hard problems. The work he won the Nobel Prize for answered most of our toughest biological questions. There are still difficulties, technology wise, but he'll beat them all."

"That reminds me, Max. Have you talked to Steve lately?"

Max looked away. "No. I wrote him a letter, congratulating him on his Nobel, but . . ." He choked.

Jason returned to the main topic. "Let me propose a hypothetical dilemma." Jason put his empty cup to one side. "Suppose someone were working on an invention that was wonderful and would help people a great deal, but that was sure to start a war as soon as the invention was completed. The war would naturally be a bad thing, but the invention would benefit people more than hurt them, over all." He banged his finger on the table. "But now suppose you also knew that other people were developing weapons that guaranteed that, if such a war started, it would end all civilization."

"I would arrange for the quiet executions of all the people who were developing weapons," Max interrupted.

"Suppose you didn't know who they were, or that there were so many of them you couldn't hope to kill them all before they found out what you were doing and killed you instead."

This hypothetical dilemma wasn't hypothetical enough for Max's taste. He had a terrible feeling he knew where Jason was heading.

Jason continued. "What would you propose that we do, in such a situation?"

Max ran his hand threw his thinning hair, desperate for a better idea than the one Jason was sure to propose. "I don't know. I suppose we could start a war immediately, while we had the chance, before the new weapons were developed." Max spoke in a light, jesting tone.

"We could do that easily enough. Even a minority party leader like myself, just by whispering the wrong words in the right ears, could start a fire in any of a dozen countries that would spread to a world-encompassing conflagration. The planet is ready for it." Jason wasn't jesting at all, it seemed. "We could

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slaughter enough people to make enough room for all the survivors for centuries. Even an immortality drug would pose no threat." He stared into the coffee cup. "But that would involve the murder of billions. I have an alternative suggestion."

"What?"

"Let us further hypothesize that the war-starting invention is being developed by one individual who is unlikely to be replaced, an individual we know." Jason raised his hands helplessly. "Why sacrifice billions when sacrificing one will do the task?"

Max felt cold. "What do you mean?"

"In these times of scarce resources, high prices, and few jobs, it would be easy to find someone who would, for modest remuneration, eliminate a single troublesome individual."

"You mean kill Steve?" Max couldn't believe his ears.

"Why not?"

"Because . . ." Why not indeed? "Because Steve is a *good* person. He's dedicated his life to saving lives."

"Are there not people like that among the billions you'd rather slaughter?"

Of course there were.

Jason continued. "Shall I start the war?"

"No."

"Why not?"

"Because . . . because people like Steve are the reason why Man is worth saving. If, in order to save Man we have to kill the people like Steve, then Man isn't worth saving; what we would have salvaged with his murder would no longer *be* Man, but something less wonderful, something hideous."

"I was wondering," Jason said reflectively, "if you would ever come to that conclusion."

CLASSIFICATION:
TOP SECRET
AUTHORIZATION KEY:
LAND SPIRIT
ACCESS KEY:
BARBARA
NOTE TO GENERAL STOEHRMAN ON DEVELOPMENT OF THE GROUND-ATTACK HEAVY ORBITAL LASER (GHOL):

There are considerable technical problems that arise in upgrading a HEXPLAT for attacking ground sites, but we believe these problems can be resolved. For one thing, the emission frequency must be lifted into the gamma ray range for effective penetration of shielded targets.

But the long-term outlook looks fabulous. Current estimates suggest that we will be able to focus the beam narrowly enough to destroy individual ships and aircraft, though perhaps not individual trucks and tanks. At the same time, between the direct effects of the ray and the residual radiation consequences, we should be able to "shotgun" and deposit 90% lethality levels against lightly protected targets in a 5,000-square kilometer area in six seconds. This is equivalent to incinerating all of Germany in three minutes with only two GHOL platforms.

"Some will not believe me when I say that we stand daily on the edge of the holocaust. What has saved us, they ask. And why won't it continue in the future, they demand." Max looked

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around the room at some of the prime offenders.

"Humanity is doomed because its vision is impaired." Jason started another diatribe.

"Do you really believe that, Jay?" Max really wasn't up to a battle this early in the morning. He looked at Jason: was even Jason really up to it? His smile was the same, the feverish energy still shone in his eyes. But he had become more pale in his three years as a senator. He was thinner. And the darkness that circled his eyes was deeper now, heavier with sorrow.

"Yes, Max, I really believe it."

Max was stunned; for the first time, Jason answered that question without frivolity. This was serious. Max spoke softly. "What's wrong with humanity's vision, Jay?"

"We have a planetful of people, many of whom are individually capable of planning carefully for twenty- and thirty year periods—at least long enough to pay off a house mortgage—yet when they act as a group they can't plan for consequences just one year away. It's a classic case of two heads being half as good as one." He slapped his hand on the table, got up and paced back and forth across the kitchen. It was a different kitchen from the kitchen at which they first argued so many years ago. The table was less elegant, and the atmosphere was less homey; but it was home here in Washington nonetheless. It was gray outside, and the grayness leaked in through the window.

Max cleared his throat. "Is there some way we can beat that, to make people as smart collectively as they are individually?"

"I don't know!" For the first time, Jason seemed afraid and without an answer. "Our species is no better than the evolutionary forces that made it. Evolution too is shortsighted: every step that evolution takes must be an *immediate* improvement, standing on its own. Neither Man nor evolution could compete against even a mediocre chess player: neither Man nor evolution could make a bishop sacrifice, even if they *knew*, beforehand, that the sacrifice led to mate in two moves."

"As in the safety net program."

"Exactly." Jason shook his head. "Investment in new research is down to one ten-thousandth of a percent of gross national product. There were fewer new patents issued this year than any year since the nineteenth century. Ask any individual, and he'll tell you that without investment in new and better ways, our growing population will live deteriorating lives until, in desperate grabs for each other's wealth, someone starts the war that leads to the Final Confrontation. Any individual will tell you that there's no money for investment because ninety percent of all wealth goes into the maintenance programs of the social safety net." He threw his hands in the air. "But when that man goes to vote, he says, 'Yeah, but I want to get *my* share of the safety net before you get rid of it.' " Jason shook his head.

Max leaned forward. "But the Final Confrontation may not be too final, if we can hold off until we can get to the other planets. If we can spread mankind far enough, someone will survive."

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Jason sat down on the edge of the seat. "Will they, Max? I've been thinking about this lately. It's so much harder to *create* than it is to *destroy*. That's the basic law of nature, you know: entropy. The total quantity of disorder in the universe always rises, any time you do anything. Entropy always sides with the man who wants to destroy beautiful things, as long as he doesn't try to put anything in its place. It's *always* easier to destroy; and as technology advances, the technology of destruction will continue to advance faster than the technology of creation, because entropy will help the destruction. Any technology powerful enough to transport a man to a safe place can produce weapons powerful enough to destroy him after he's arrived." He hit the table even as Max opened his mouth to contradict him. "Sure, sometimes there've been time lags, but the weapons always caught up, and as time goes by the speed with which they catch up will speed up. We can't outrun our own technology, Max."

"If we can hold out long enough, eventually we're bound to find a way to prevent war: a sociological solution. Then it won't make any *difference* how powerful our weapons are."

"But how long will it take us to get there, Max? Where are we going to get the time to wait?" Jason's hand slapped the table. "How do we persuade a society to take near-term action to solve long-term problems? *That* is our short-term problem."

CLASSIFICATION:
TOP SECRET
AUTHORIZATION KEY:
TAR BELL
ACCESS KEY:
SERENDIPITY
MEMORANDUM TO GENERAL BRADLEY ON DEVELOPMENT OF THE GRAVSHIELD ANTI-LASER DEFENSE

Though theoretically feasible, the practicality of gravshield defenses for cities against GHOL platforms is nil. Several technological revolutions will be required to permit a shield generator to cope with the concentration of energy that a GHOL can achieve. We continue to investigate; the technology will certainly evolve, but it will probably be decades in development.

In his mind, Max answered the laughing ghost, who knew that this roomful of people could never make a decision to save tomorrow.

Jason, I know the answer. I know how to make people find a solution that will take years and years to implement. But God, Jason, it's hideous. Isn't there a better way?

The ghost did not answer.

"We have survived, sometimes because of skill, and sometimes because of luck. But more importantly, we have survived because some people have given their lives to guarantee our survival."

Jason's campaign speech ended. They hustled Jason off the platform toward the waiting helicopter, leaving Max to field the endless questions.

"Then tell us, Mr. Palmer, do you really think Jason Masino has a chance at the presidency?"

The questions came at Max from all sides of the throng that was mostly re-

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porters. Max turned in the general direction of the question and chuckled. "Does he have a chance?! I pity his competition! And I urge them not to trap themselves into a debate with Jay on TV. If they do, Jason will rip them to shreds."

"Can we quote you?"

Max shrugged. That statement probably wasn't the most politic thing he had ever said, but one of the wonders of watching Jay run for president was that you didn't *have* to worry about every little word. Jason was the first candidate in decades who *was*, clearly, better than his opponents. "Go ahead and quote me. Why not?"

A different voice rose above the din from a different direction. "Mr. Palmer, as Jason Masino's foremost advisor, what role would you expect to play in the executive branch? Do you see yourself in a cabinet position?"

Of course, you still had to be a *little* politic in any democracy. "That is entirely Jason's decision. I am an advisor only. I certainly wouldn't presume to second-guess his future decisions."

Max could see the helicopter's rotors whirling to takeoff speed; Jason was safely aboard. Max excused himself and headed for the landing platform, where another helicopter would arrive shortly to pick him up.

As he progressed through the crowd, his eyes were drawn to a large, curiously dressed young man, with a great overcoat too long even for him, the overcoat whipping in the wind. As Max watched, the man reached into his coat and pulled forth a short rocket launcher.

"No!" Max screamed, tossing people out of his way to reach the man.

The man calmly adjusted the sights, and Max could see him muttering to himself as he squinted to track the helicopter.

Didn't anybody else see what was happening? Where were the Secret Service people? Was this real?

The man nodded, leaning back a little deeper in preparation for the launch. "Stop!" Max yelled hysterically.

The man opened his other eye, startled, but as Max leaped for him he squeezed the trigger.

With a snarl Max chopped the man in the throat. As the man gurgled for breath, Max brought a rigid index finger up into the man's eyeball, thrusting his finger as deep as he could reach. The man thrashed raggedly, hanging from Max's finger. He fell away.

Max looked up to see a trail of whistling smoke reach the helicopter. A bright jet of fuel burst from its side. The helicopter lurched, then spun end over end until it reached the ground. A brighter jet of exploding pieces burst from the wreckage. Max ran toward it.

Some newspaper reporter, much too swift on his feet, ran up to parallel Max's running. "What if Jason Masino is dead, Mr. Palmer?" the man yelled. "What will you do?"

"I don't know," Max yelled back. "He can't be dead."

"But if he is . . ."

Max struck the man in the face and continued toward the wreckage.

What could he do? What could he do? The question pounded in his brain. The world: it was dying. Jason had seen it in all its details. Jason had understood the dangers as no other man ever had, and Jason had been afraid. Jason had

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been afraid that even he, Jason, would fail to save mankind. If even Jason had been afraid of failure, what other man could possibly succeed?

Yet somebody had to. And to have any chance at all of succeeding, somebody had to try.

Max held a press conference one week later. "There has never been a man as great or dedicated as Jason Masino, and perhaps there never will be again." He paused to get control of his voice, which still got away from him at times. "But the greatness of Jason Masino should not be allowed to perish just because the man himself is gone. It was his *spirit* that held his greatness, and that cannot be killed. His dreams, his hopes, his visions are *ours* now. We can still build a future as great as his greatest imaginings." He looked around the audience with a slow, determined gaze that would one day be famous. "Therefore, I hereby announce my candidacy for president. I can never be Jason Masino, but I can, with your help, be the implementor of his dream."

"But do we dare depend on skill and luck, and the sacrifices of a few rare men, forever?"

FROM: Carl Stroud, Chief of Simulations, Global Resource Analysis Center

Dear Max, Max read in the memorandum the day before he was to present his speech on the cancer cure. *I've been running scenarios frantically for the last three weeks. I guess you'd guess that.*

As you predicted, we cannot create a scenario for survival that includes a cure for mutant II cancers. Of course, you'd guessed that too.

But in an effort to retune the simulation, hoping to find a technical flaw in our approach, I ran scenarios across the last decade, using real-world history as my input. Max, in fifty simulation runs, Man never survived our most recent ten years!

So I cursed and fumed, because of course we did survive (we did, didn't we? Sometimes I wonder) and I made debug dumps.

The simulation is good, *Max—I knew that there had to be something wrong in the data. So I tweaked and calibrated.*

I only found one adjustment that let mankind survive consistently: I inserted a leader-actor for America who was superhuman. It worked. The outputs stabilized on what the world's last ten years of history actually look like.

Max—that leader-actor was you!

We can *survive, with you as president! Please, Max, sign that bill!*

Max's eyes watered. *I wish I could, Carl.*

Perhaps Jason could have done it. Max could imagine Jason repealing the two-term presidency constitutional amendment. Max could imagine an immortal Jason, using the next generation of viral robotoids to keep himself young, successfully balancing, checking, and countering all the forces that tried to destroy Earth, for years without end.

But Jason wasn't available. And Max was running short on tools to use in the fight. Someday, he knew, Kiril would call Max's bluff—even if Max could retain power, which he could not. In two years his second term would end.

Who would be the next president?

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Max knew the leading contenders, perhaps better than they knew themselves. Most of them were honest, sincere men; but none of them met the requirements for world-savior.

Even Jason might have failed; even Jason never found a solution to the general problem: how do you make a society make a sacrifice today, when the benefit won't be seen for decades?

But Max had been given the answer—*a gift of the gods*, Max thought with near reverence, though he had long since lost faith in gods. But it was a gift so perfectly timed, it almost had to be supernatural. *Jason, did you somehow reach out of the tomb to give me this answer?*

Certainly not. Jason would have rejected an answer like this; it was a hideous answer. If the answer really had been designed at all, it must have been designed by darker powers. It was so hideous Max feared it even more than he feared the Final Confrontation.

"Are we such fools that we are willing to play games with the survival of the whole human race?!"

Max could give the foolish, impetuous, men-children of the world a message that even Jason couldn't deliver. Max could give them a message that would last decades; not because of his indisputable logic, or his silver words, but because of the last tool he had left with which to touch them, because of the last gift he could give them. It was a rare gift, that which he could give them, perhaps unique among gifts in being respected everywhere among the peoples of Man.

He could give them a martyr.

Max looked out at the throng of congressmen, now utterly silent, and looked out at the cameras, and the people all over the world, and raised the procurement bill once again into the spotlight. He ripped it to tiny, tiny pieces, there in the burning brilliance. "You have a great task to do, Men of Earth." For a moment Max felt the ghosts gather round him—to augment his strength this time, not steal it. "You have many problems to solve. You must build a defense against the current generation of hideous weapons, for weapons are dangerous as long as the unsane may obtain power. You must begin the birthright lottery in earnest, so that the unsane will find few followers unsane enough to follow. You must destroy the social safety net that has given you the security it promised, but has taken away the growth that was the original promise of America and the only true security available for Man. You must rebuild the space program, and its ships, and you must establish people in places of safety." He lifted his hands, and the shreds of paper scattered from the podium. "And you must never, never, think of saving lives today, when tomorrow is so far away." He bowed his head. "I thank you."

There was clapping, but it was perfunctory: the audience, the congress, was stunned into rare speechlessness. Max saw that even his fiercest enemies now looked at him with respect, transfixed as Jason might have transfixed them.

Max smiled bravely, shaking hands with a few as he proceeded to the door. Still his weakness didn't show. He climbed into the presidential limousine

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surrounded by well-wishers and flash-popping cameras. He pulled the curtains as the car swung into motion.

The trembling began. *"No, no,"* he moaned, curling into a foetal position, all alone with the ghosts. *"No!"* He coughed, the same hacking cough that had sent him to the doctor just three short weeks ago.

"What's the verdict, Dr. McFarley? Will I survive my cough?" Max asked playfully. He rebuttoned his shirt. It was cold in the doctor's office; but then, it's always cold in a doctor's office.

Dr. McFarley looked back at Max grimly.

The chill in the room deepened. "Is it bad?" Max asked, no longer playfully.

Dr. McFarley sat down next to him. "It's lung cancer, Max. Mutant II lung cancer."

Max's heart skipped, skipped, skipped. "It *can't* be!"

There was a long pause. The doctor cleared his throat. "You have nine months. Maybe a year." The doctor looked away. After a moment of meticulous study of his fingernails, he continued, still not looking at Max. "Only Steve Felman can help you now. I'm sorry."

A tear squeezed from his closed eyes. "*I want to live! Please*, let me live!"

The ghosts had no answer save silence. ■

● One of the interesting things about a really meaty idea is that it can suggest so many different things to different people who get hold of it. There's been at least one case of an original science fiction anthology composed by throwing the same basic concept to a dozen or so different writers and publishing what they built on it—which was a dozen or so distinctly individual stories. My present case in point is a concept which recently surfaced in the serious scientific literature but was quick to engage the imaginations of SF writers: the "biochip," a fusion of biological and semiconductor technologies to produce a microscopic logic module capable of interacting directly with living cells. You'll find it embedded in the background of Marc Stiegler's story in this issue, and you'll also find it at center stage in Greg Bear's "Blood Music" in our June issue. There the resemblance ends, though; the stories are about as wildly different as two stories can be. "Blood Music," actually, is a pretty wild story by *any* standards—and the most chilling thing about it is that I'm not quite sure it isn't possible.

The fact article is an interesting commentary on how times have changed. Not too long ago SF people were laughed at for believing man could go to the Moon. Now we have a perfectly respectable engineer who helped make that happen—Gordon R. Woodcock—telling us how we *can* go "To the Stars!"

IN TIMES TO COME

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Jay Kay Klein's biolog

In the "Golden Age" of science fiction a large number of the best science fiction writers were developed by John W. Campbell, former editor of this magazine (which, in effect, created that age). Judging by story quality, if there ever existed some other metallic age between then and now, we're surely back to the gold standard today. Marc Stiegler continues in the golden tradition of *Analog*, tracing his success as a writer to the present editor. Since Stanley Schmidt was one of the last authors developed by Campbell, Marc feels there has been a sort of apostolic laying-on of hands.

Marc was a sophomore physics major at Heidelberg College in Ohio when Dr. Schmidt was an assistant professor of physics who also taught a science fiction course. Marc was told "write, write, and write—you'll make it." So Marc wrote some twenty to thirty stories in the next six years, until finally one sold to the new editor of *Analog*—none other than Marc's one-time professor. "The Bully and the Crazy Boy" appeared in the November 1980 issue, and an AnLab poll placed it the third favorite short story of the year. "Bully" combined psychology and physics with a computerized war-gaming background—just the sort of triple threat *Analog* readers like and Marc is capable of handling.

By that time Marc was a graduate computer science major. He had thought after a multi-majored degree in physics, psychology, and mathematics to continue for a doctorate in physics, but discovered at another university that not all professors were as inspiring as Dr. Schmidt. With an M.S. in computer science from a Virginia college, he now works as a software engineer for a "Beltway Bandit" in Washington, D.C. (i.e., one of the government contractors who, in Marc's opinion, do a far better job than the government does when left to its own devices).

In addition to science fiction, Marc also writes articles on computer programming for computer trade publications, such as the May 1982 *Kilobaud Microcomputing*. When not behind a word processor, he may be found behind a chessboard, wielding an épée, or dancing ballet. And sometimes, like Dr. Schmidt, he may be found backpacking across rugged terrain for the sheer joy of it. Strangely enough, both Marc and his mentor were born in Cincinnati, living within a few miles of each other for the first ten years of Marc's life, though they never met until he was twenty. In a fantasy magazine this would probably be attributed to Destiny. In *Analog* it might more likely be compared to a noble element meeting a most unusual catalyst. ■

Marc Stiegler

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(Continued from page 10)
stages of maturation?

Someone with a less theological and more biological bent might ask similar questions in different language. As a biologist friend of mine put it, a human embryo *is* different from analogous forms of other species—quite demonstrably and unequivocally—at a microscopic level. Even though it is momentarily quite similar in macroscopic form and physiological functioning to its "lower animal" analogs, its DNA carries a full set of genetic programming which, given the chance, will eventually transform it into a functional human being.

This is pretty clearly true. Furthermore, it is true all the way back to the instant of fertilization. If this is your criterion for humanity, *and* if you believe that human lives, whether "potential" or "actual," must never be destroyed, then the right-to-life advocates have won at least a good part of their case.

But to what extent *is* "potential" humanity (like that of a one-month embryo) equivalent to "actual" humanity (like yours or mine)? Does having the genetic potential to become functionally human mean that an embryo *is* human, or is humanity only earned when a certain amount of that potential has been achieved? One who believes that no ethical distinction can be made might reply with an analogy: destroying a photographic negative destroys a *picture* as genuinely and permanently as destroying a print—perhaps even more so, if no prints have yet been made. To the photographer, it doesn't even matter very much whether the film has been developed to the negative stage. If he has composed the picture and exposed the film, but loses it on the way to the darkroom, there is still a sense of loss.

But that loss is, in general, at least somewhat less than if he had actually *seen* the picture, instead of just knowing that the information to produce it was recorded somewhere.

How valid is that analogy? I don't know. I know it's not perfect; perfect analogies are called "identities." But analogies are possible only because *some* similarities actually exist between the things being compared.

The exact meanings and relative values of "potential" and "actual" are important subsidiary questions. The *central* issue in the "right-to-life" controversy remains, not "When does *life* begin?" but "When does *humanity* begin?" In his story elsewhere in this issue, Timothy Zahn considers that question from another point of view. Neither of us presumes to have The Final Answer, and I think we both suspect that the answer is not simple. My hope, for now, is just that we all get clearly in mind exactly what the *question* is, before we get too violent with each other over answers. ■

● He who knows nothing, loves nothing. He who can do nothing understands nothing. He who understands nothing is worthless.

Paracelsus

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the reference library

By Tom Easton

The Citadel of the Autarch, G. Wolfe, Timescape, $15.95, ? pp.
2010: Odyssey Two, A.C. Clarke, Del Rey/Ballantine, $14.95, 294 pp.
Foundation's Edge, I. Asimov, Doubleday, $14.95, 367 pp.
Sideshow, M. Resnick, Signet, $2.50, 154 pp.
Nor Crystal Tears, A.D. Foster, Del Rey/Ballantine, $2.75, 233 pp.
A Barnstormer in Oz, P.J. Farmer, Berkley, $5.95, 278 pp.
The Windhover Tapes: Flexing the Warp, W. Norwood, Bantam, $2.75, 231 pp.
The Pirates of Rosinante, A.A. Gilliland, Del Rey/Ballantine, $2.50, 224 pp.
The Prometheus Man, R.F. Nelson, Donning, $5.95, 233 pp.

Have I got a column for you this time! Chock full of goodies! So star-studded I should call the column "Astro-Views"!

Stop frothing, Easton! Cool it. Make it clear that "AstroViews" is all yours and the astronomy mags had better keep hands off (unless, of course, they have a prior claim). Tell the readers what the devil you're raving about.

Okay. I have here the latest novels by Wolfe, Clarke, and Asimov. In addition, I have Resnick, Foster, Farmer, and more, but the first three are all long-awaited, drooled over by millions—tens of thousands?—of fans, and loudly ballyhooed. You'd rave too if you had to judge such deities.

But let's get with it. Let's start with the fourth volume of Gene Wolfe's Book of the New Sun, **The Citadel of the Autarch.** It's stylistically excellent. It wraps up bales of loose ends. It explains New Sun, cacogens, Severian's parentage, and more. It even brings him to his destiny, which we have known and patiently awaited for lo, these many pages. But. But. Overall, my reaction is an enthusiastic "Eh."

The problem is that Wolfe has set us

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up with three volumes of enchanting, moving, meaningful, active story. This volume is far less moving, the meaning seems leaden, and the action is heavy-footed. Severian has traded in his past companions and lovers for a reanimated corpse and a failing hermaphrodite. He suffers fever, loses vigor and coherence; and Wolfe's style faithfully—as it should—reflects this. He suffers the confusion of battle, is rescued by gods from the machine (please notice Wolfe's almost coy defense here), and is led to his fate. He is the Autarch. Through him—maybe—the Old Sun will be revivified by means that make the tetralogy unmistakably SF. Yet he is also a puppet, manipulated by beings he understands but little, and the strings are hard to tell from those the author plucks.

The problem is—and yes, I *do* have to find problems where'er I look; it gives reviewing a critical touch and keeps the job interesting. The problem is that *Citadel* fails to stand alone. It is the final book of four. It is anticlimax, and it makes me feel a need to start over and read all four volumes straight through. Then, I think, I would find the Book of the New Sun fascinating, absorbing, and beautifully satisfying. The opus has so many plusses, not least of which are sheer size and grandeur, embroidery of language, wealth of symbolism, detail of imagination, and complexity of character. It deserves fame far more, I believe, than Peake's *Gormenghast* trilogy. It will have it, too, and Wolfe's name and work will live.

A while ago, Timescape and Wolfe announced there would be a fifth volume in the series. A fifth book is still on, but the "about the author" note at the tail of this volume calls it "an independent book." It *will* "further illuminate" Wolfe's future history. It will be *The Urth of the New Sun*. As an "independent" novel, complete in one volume, it should stand alone beautifully. I hope that it successfully compresses the charm of the tetralogy into its smaller scope. If it does so, it should surpass any single volume of the Book of the New Sun. I can hardly wait to see.

Star Number Two is Arthur C. Clarke's **2010: Odyssey Two.** Clarke does not write with Wolfe's elegance. Few people do. Clarke's style is straightforward, plain. His focus is incident, not character, and his work thus lends itself well to film.

I must admit now that I am one of the rare birds who never saw *or* read *2001: A Space Odyssey*. Somehow the hype and ballyhoo turned me off, and the idea itself did not appeal enough to turn me back on. Now I'm in before most of the hype. If I weren't, I would probably once more shy away.

Am I a bit lukewarm then? You could say that. But I am still going to review the book. It begins with a multi-national race through space to visit the Monolith and the derelict HAL-bearer, *Discovery*, in Jovian orbit. The Soviet ship wins, though it carries a team of U.S. experts to help set HAL to rights, salvage what they can of the computer's memory, and even to salvage the derelict ship. While there, they and the Soviets plan to study the Monolith, but it remains frustratingly inert until the day it vanishes, traveling to Jupiter to undergo a mysterious change.

Meanwhile, Dave Bowman returns. The sole survivor of HAL's attentions in *2001*, he became the Star Child. Now we learn that he has become a being of energy and an intelligent vehicle for the aliens behind the Monolith. On his return he surveys the Solar System and

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Earth. When his masters have learned what they need, they trigger the Monolith's conversion and set up a "No Trespassing" sign on Europa, the Jovian moon that writer Dick Hoagland first suggested might bear life. They have a mission, you see, and . . . I won't reveal it.

The book has grandeur, scope, sweep, sense of wonder, and all the rest. Yet it aggravated me, for so much of it is mere travelog, a tour of the System on the way to Jupiter. The tour has been done before, if never so well. It also aggravated me, or failed to satisfy me, because the driving force of the plot is not conflict, not even conflict with nature, but mystery. I mean mystery not in the puzzle sense, but in the religious sense, the sense of myth. There's nothing wrong with this sort of story. We need more of them, for our old religions are losing strength in their confrontations with biology and space science, and a new vision of God, a translation of scripture into the future, could do a great deal to move *us* into the future successfully. However, I do believe that what we need is a new vision, a revision, of the old, a translation. What Clarke offers us is new, yes, but it is too fictive, too lacking in old deities, too tied to the canons of a relatively small group of us, not tied enough to the canons of the world at large. I do not know whether it in fact has ties to the scriptures of the East. It might, since Clarke lives in Sri Lanka, but if it does, it still suffers by offering less to Westerners.

The religious connection, the mystery play parallel, should surprise no one. For all his technical expertise and learning, Clarke has long labored in the vineyards of mystery. This is, I am sure, one reason for the perennial popularity of *Childhood's End*. Yet I wish, oh how I wish, that someone could offer us a salvation centered on space and the future, that did not owe so much to the Little Green Men of yore!

What do I want? I would like someone to *convince* the world that Eden waits beyond the further stars, or past the turn of the century. I want a goal that will pull us onward as the lures of El Dorado and the Fountain of Youth drew the Spanish explorers into the New World. I want . . . *promise*. And I don't think that can be delivered as long as the promisers couch their dreams in the idioms of genre fiction. I *don't* know how to do it right.

Clarke tries. In his less obvious way, so does Wolfe. So do many other SF writers, though less effectively. Is there anyone else? A few, maybe. Carl Sagan, and a precious few more, all still less effective. In my darker moods, I despair of SF's grand dreams. I despair of the human future. I despair of . . .

Stop it! Is the book any good? Yes.

Star Number Three is Isaac Asimov's **Foundation's Edge,** the book Doubleday badgered him into writing, the fourth in the famed Foundation series. Would you believe he's left room at the end for *another* sequel? He has.

The question you're all panting to ask, I know, is, "Is it as good?" My answer is yes and no. *Edge* does not feel like the earlier books. This is partly because Asimov wrote it as a novel, not as a series of shorter works. It is also partly due to time and maturity, as Asimov anticipated. He is no longer rushing confidently where angels fear to tread. He is more thoughtful, slower paced. He no longer ignores such questions as why the Foundation galaxy is peopled only by human beings as he did when young and in a hurry to give John Campbell a rip-snorting story of human

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supremacy. Now he knows such a galaxy is unlikely, and he offers an explanation in terms of selected time-tracks. He tries to cover other holes, too, and he gives us links between the Foundation future history and the robot novels. He tries, in fact, to unify much of his work in a single future history.

He doesn't entirely succeed, for the effort seems strained. Perhaps he shouldn't have tried, even though in one respect the effort pays off handsomely. The story takes place some centuries after the end of the trilogy. Seldon's Plan is working flawlessly—too flawlessly. Two characters—one, Trevize, in the First and one, Gendibal, in the Second Foundation—realize this. Trevize believes the Plan's perfection means the Second Foundation still exists. Gendibal believes there must be a third party. Trevize is exiled and told to search for the Second Foundation. Gendibal searches for his bogeyman. Both wind up in the same place: the Mule's home world, Gaia, where all men, all women, all creatures great and small, even plants and rock and soil, share in a single consciousness. This world is an ultimate development of Second Foundation-like disciplines, provided they go one way and not another. It is concerned with the Foundations, and it tries to steer their path toward a conscious galaxy. The connection with the robots is so neat, I won't even hint at it. By itself, it hints that there may be a reconciliation of First and Second Foundations other than that of the conscious galaxy. Asimov doesn't recognize that possibility here, but he may be holding it in reserve for volume five.

Edge owes a great deal to the trilogy and contains perforce a fair amount of recapitulation. It therefore does not stand alone as well as it might. It is the capstone of a career-so-far, the tie that binds varied elements together. Yet it does stand alone as a summary, and it might be an excellent introduction to Asimov's corpus, serving well to interest a new reader in all that has gone before.

Mike Resnick's **Sideshow** is the first volume in a new series, his Tales of the Galactic Midway. It also strikes me as much better than the last Resnick yarns I reviewed. *Sideshow* reminds me far more of Charles Finney's *Circus of Dr. Lao* and Tom Reamy's *Blind Voices* than of Barry Longyear's circus stories.

The narrator is the hunch-backed assistant to a venal, cold-hearted carnie owner, Thaddeus, whose great dream is of wealth. He sees his opportunity when at one small-town stand he encounters a competing freak show whose freaks owe nothing to makeup and all to nature. He schemes to take the show over, succeeds, and hits the road. Wealth is his!

However, the freaks are aliens, tourists in the only disguise that can guarantee anonymity. From their point of view, *we* are the freaks and they the spectators. To them, Thaddeus's takeover is a disaster. They are now slaves, lost on an alien world, sickened by unfamiliar gravity, food, and weather. They despair. Yet Thaddeus's heart softens strangely, and in the end emerges a solution to please all. The carnie will split. One unit will stay on Earth, a safe house for alien freaks. The other will go to the stars.

Resnick's tale is far more psychological than Longyear's. He focuses on character here, and he effectively displays an evil that is less evil than pain, deserving not damnation but sympathy and the salvation it finds. I enjoyed, and I look forward to the next Galactic Midway tale.

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Alan Dean Foster has given us a series of novels of a future in which humanity has teamed with an insectoid alien species, the thranx, in a fruitful symbiosis. The two species partition worlds according to which parts suit them best, the thranx preferring heat and humidity. They work and fight side by side, their talents complementing, their existence in fiction an emblem of the ecological patterns that rule the world and that we often deny to our peril. Foster's vision is intriguing; I would love to think it could really be, for it could make life richer, and it might be one of the best things the future holds. However, it is surely too rational to work.

How did human and thranx get together in the first place? Foster has never said, until now, in **Nor Crystal Tears.** The story is told from the viewpoint of Ryozenzuzex, a thranx on the agricultural periphery of his society. Born with the talents and interests of a generalist, he has no niche until he hears of strange aliens met in space. Persevering bravely, he travels to the homeworld, Hivehom, to meet the humans and become their interpreter. When the thranx authorities refuse out of fear to let the humans go, he helps them escape and goes with them. In human territory, the humans he rescued then help him escape those who would dearly love to dissect him, alive or dead. They alone have learned to overcome humanity's deep-seated fear of bugs, and they make possible Ryo's scheme to bring the two species together.

Foster knows his symbiosis may be too sensible to work. He has Ryo propose it, in fact, and see it rejected. But then he lets Ryo find a way to move toward it. He lets optimism triumph over paranoia and cynicism. I love him if only it could be.

Philip José Farmer is a game player. (That's news?) He loves to interweave modern SF and the old pulps, putting Tarzan, Doc Savage, Mark Twain, and more, together and apart, into new settings. Now he's done it again, with **A Barnstormer in Oz.** Dorothy's son, a 1920s aviator, flies through a green cloud to Oz, where he meets Glinda the Good and helps her defeat a new wicked witch. In the process, he sees an Oz that makes a certain sense in SF terms. He neatly contrasts childhood fantasy with the technicalities of the childhood of aviation. And he finds that Glinda may not be as Good as she seems.

There's not a lot else to say. The book will surely appeal best to those who remember Oz fondly. Others may well find it a touch too cute. I do.

Farmer's **The Purple Book** is a collection of strange yarns including "The Long Wet Purple Dream of Rip van Winkle," in which Rip meets the Shadow. There is also "Riders of the Purple Wage," which shows how people live when all necessities and many luxuries come free from a government atop the economy of abundance; for some reason, it won a Hugo. There is "Spiders of the Purple Mage," from Robert Asprin's Thieves' World series. And more, all typically irreverent, titillating, and light. I didn't think it among Farmer's best works.

Warren Norwood's **The Windhover Tapes: Flexing the Warp** continues the adventures of Gerard Manley as he travels about the universe in his sentient ship, *Windhover*, recruiting scholars for Jelvo Universal Institute and searching for his mindwiped memory. It's a very personal, very interior tale, told again in the form of extracts from his diary

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on *Windhover*'s tapes. However, it works less well the second time around. We find *an* answer to Manley's past, we see his child born, we see fights with pirates and villains. But all is offstage, at third hand, and it grows more quickly tiresome than in the first volume. Disbelief refuses to suspend.

There will be a third volume, but I don't think I will read it unless it looks much better or report on it unless it *is* much better.

Alexis Gilliland's **The Pirates of Rosinante** is the third in a series whose second member I reviewed a few months ago. That was *Long Shot for Rosinante*, and it was fun. So is *Pirates*, for the habitat among the asteroids, Rosinante, having declared and won its independence, must now fight to stay free. It succeeds by building a super-speedy space tug and threatening Japan, home of the fleet on its way to subdue Rosinante. It has help from its intelligent computers, one of whom, Sasquatch — excuse me! I mean *Skaskash*—has devised a new religion suited to space and a future in which robots and humans must be symbiotic intelligences. The robots convert humans to the new religion and thus ensure the rejection of Earth.

Gilliland writes with his tongue firmly in his cheek. He refuses to take his own vision or the clichés he exploits too seriously. He is thus a pleasure to read. However, I sensed several voids in the story, as if he were not simply skipping details to keep the yarn moving, but had shortened the tale—or had seen it edited—clumsily. Don't fret, though. The voids may have contained useful bits of plot, but they really interfere very little.

Our last item this month is Ray Faraday Nelson's **The Prometheus Man.** He shows us a world in which few people can have jobs. The work goes to those who pass an exam when they are done with their educations. Those who fail are sterilized and shunted into vast barracks much like concentration camps, where they vegetate. The situation has apparently existed for years, even though the solution is so drastic that the problem would have evaporated within a generation.

A few people know that this world is too unstable to last. Among them is Bradbury Douglas, who has built the *Valhalla*, a giant hot-air balloon crewed by "Prometheans" who will descend to Earth after the inevitable debacle and take over. Somehow, the employed class will forget their ruthlessness and let the animals out of their cages to destroy everything, wiping the slate clean for a fresh start by Douglas's carefully selected elite.

Is Douglas the Prometheus man? No. That honor belongs to failure Newton McClintok, resident of the unemployables' high-rise ghetto, who is learning the new philosophy of the singer Baboo, who believes in sharing and love. He it is who finally pulls a new future from the ashes, when even the Prometheans have failed.

Maybe so. I can't fault Nelson's dream. We *are* short on fellow feeling. But I do not think Baboo's and Newton's dream is the species' salvation. Like the story, it is simplistic, naive, Pollyanna-ish. I suspect we are more likely to find salvation in some unifying goal we can pursue despite our defects, our selfishness and meanness.

What will that goal be? Will we find it before it is too late?

Damnfino. ■

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brass tacks

Dear Mr. Schmidt,

The "Mid-September" issue of *Analog* contained a little more bitterness than I usually like to pay for. I'm certain you put "Rails Across the Galaxy" at the very end so that front-cover-to-back readers would not kick their dogs with frustration as soon as they finished reading.

I hated Sam Nicholson's story, "He Who Fights and Runs Away." One way or another, it is an appropriate title. I was not fond of any of the characters. Thank You God, and kill them all with floods and fire. A short burping of the sun might do for those in the wheel, a sort of mini-nova. Oh well, it made me think.

Jerry Pournelle's article concerns me more. I'm certain many readers stood up and cheered as they read it, but these are not the people he needs to communicate with. Insults, however justified, are seldom beneficial.

I am acquainted with Mr. Pournelle's economic thoughts, and to a certain extent I agree with them. I know the frustrations he expressed. Once I flunked a university economics course for fear that I would pluck the professor's spectacles from his face and break them over my knee if I ever confronted him directly. I hid out for the entire course in the back of the room, taking many notes, often obscene. Nowadays I can discuss the subject calmly, and I regard that class as one of my better learning experiences.

I would like Mr. Pournelle to know that I am literate with computers, skilled in both hardware and software, that I read his writing in *Byte*, and sometimes have mind to understand the bases of statistical calculation. But like most of us, I often wade through calculations mindlessly, accepting computer outputs without question, and entirely unsus-

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picious of my inputs. And so do the builders and operators of nuclear power plants. The accident at Three Mile Island didn't wipe out Pennsylvania, but it wasn't a cheap lesson, either.

A useful motto, one I've stated in other letters and in other terms, is to attack ignorance, not individuals. Ignorance cannot be fought by screaming names at one another from opposite sides of the fence. Ignorance is best fought with concern for one another, over lunch, with a smile and a handshake. Mrs. Roberta Pournelle does not teach her students to read without concern for them. She does not call them names until they tune her, or throw her, out.

It would be a good thing to mix the "hard" science and engineering students with the other students. It is more important to mix school staffs. At every large school I know this mixing does not occur. The staff and students divide up into little camps, call one another names, or at best stick to non-controversial subjects like the weather when talking to one another at all.

The suggestion that budgetary restraints be placed on the so-called "social sciences" is inflammatory. It will only alienate potential allies within what have become very political educational structures.

Whatever faults these structures have, it is best not to tear into them rashly. An engineer with an inferiority complex is still an engineer, and perhaps his self-confidence in other subjects can be bolstered outside of school. Schools are still providing very necessary services. We can't afford to lose a generation to politics as, to give an extreme example, happened in China.

The "hard" scientists and engineers doing the most good are friendly and accessable. They do not hide out in their own little corner of the lunchroom and sneer at everyone else. Mr. Pournelle's energy would be better spent by seeing to it that engineers and "hard" scientists get a better social education so that they need not feel inferior when discussing social questions, and by building bridges with the social scientists so they are better acquainted with, and respectful of, the "hard" sciences and engineering.

CRAIG HAMILTON

Camarillo, CA

Dear Dr. Stan:

Oh joy, oh bliss! Finally, a letter in "Brass Tacks" I feel competent to answer. I refer to Mr. Ben Johnson's complaint about the ambiguity of the pronunciation of those lovely alien names.

The answer came to me during a conversation with a native American friend about a dictionary of the Menominie language that had recently been compiled. The dictionary has been transcribed into normal English spelling, losing many nuances of native pronunciation, when a perfectly useful alternative has existed for years. The International Phonetic Alphabet, my learned professor assured me, can accommodate any sound the human vocal apparatus can produce (and then some, if my own experience serves as judge). Transcribing "alien" words in the IPA, with a tag to that effect, would considerably ease the pain of fans such as Mr. Johnson (and myself). It would also ease the confusion at cons, while fans sort out whose pronunciation is the "right" one. As any logophile can tell you, the IPA can be had for the asking at your friendly neighborhood dictionary.

I hope this letter spreads a little sunshine in the shadowy world of SF read aloud.

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CAMILLE BACON
Lindenwold, NJ

I agree that the IPA would be a big help with possible human names—if enough readers were familiar with it, which unfortunately doesn't seem to be the case. Of course, even it would run into problems with really alien *names—just try to use it to spell out an utterance by a bulldog, bullfrog, or bull!*

Dear Mr. Schmidt,

The amount of public interest in the dangers of nuclear warfare and the desirability of a so-called nuclear "freeze" (unilateral or universal) almost inevitably brings up Hiroshima and Nagasaki. The destruction of these two cities in 1945 by relatively crude atomic fission weapons remains the only wartime use of such devices to date. Given the very horror of a weapon that can achieve within a matter of minutes what would normally take hours to accomplish (firebomb a city such as Tokyo) there are likely to be many people, including some who should know better, that will have a "gut feeling" that these weapons should *never* have been used. This letter will attempt to present a view not normally expressed about the use of atomic weapons on Hiroshima and Nagasaki. I do not have a preference one way or another on this subject, though a somewhat selfish reason will be evident as the discussion continues.

The time is Summer 1945. Imperial Japan has been forced back to the Home Islands with grievous losses in men and materiel. Submarines and air-laid mines have just cut off the last shipments of food and raw materials from Korea and Manchuria. Fuel, medicine, and food supplies for the people of Japan are almost unavailable as winter approaches. The pitiful remnants of the once-powerful Japanese military forces prepare for the expected invasion, planning to literally go out in a blaze of bloody glory. Those in government who want to end the war are prevented from doing so by the militarists. A nation of over 100 million people will die by battle, disease, and starvation within the next year or two if nothing is done to stop the conflict.

Let us look at the price to be expected if the Home Islands were to be invaded. American casualties from all causes in World War II were about 1,076,245. This is broken down as follows: 291,557 battle deaths; 113,842 other deaths; and 670,846 wounds not mortal. Total serving personnel was 16,112,566. Planning for operation "Downfall," the invasions of the Home Islands in 1945-46, produced estimates of U.S. casualties ranging from 250,000 to 1,000,000. This would be an *increase* of from 23% to 93% in total American war casualties! Japanese casualties had been about two million for the war to 1945. Had it continued, at least another one to three million more people would have become casualties. Starvation and disease would have boosted this toll much higher.

Hiroshima and Nagasaki cost about 120,000 casualties, less than the single worst fire-bomb raid on Tokyo. The very horror of the atomic bomb attacks on Hiroshima and Nagasaki stunned everyone in Japan, so much so that the Peace Party was just barely able to surrender and stop the war. They almost did not succeed.

In wartime one has to "play god" with lives for every decision made—or not made. Lack of information makes many such decisions just so much guesswork, yet they have to be made. President Truman made the decision to

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use the atomic bombs that saved many lives, American *and* Japanese, on the basis of the information that he had available at the time. There were only *two* operational bombs at this time, so whatever had to be done *must* work the first time. A simple demonstration on a deserted island might not have brought a Japanese surrender—and oh, the cost in lives if the war had continued! I have a personal stake in Truman's decision: one of the lives saved was that of the young man, a radioman in the 77th Infantry Division, who would one day become my father.

Today we have what might be called a "balance of terror" with nuclear weapons. It is often thought to be precarious and rightly scares people — including myself. Yet this very fear may well have bought the world a period of quasi-peace, for there has been no world war since 1945, despite numerous opportunities for one to start. Smaller wars, while bloody, are relatively short. Remember that in a "cold war" less people are killed than in a "hot war." It may not last, this "peace" that we live under. But since it is the only game in town, we don't have much choice. And, when you attempt to judge decisions made 37 years ago, consider how many people living today do so just because Hiroshima and Nagasaki died. The cities have been reborn, and serve as a reminder of just what a conventional world war costs; some 50 million people died in World War II. Who knows: nuclear weapons may one day be thought of as a sort of vaccination against global conflicts. I leave you now to think a bit on the implications of this letter's information.

GORDON J. DOUGLAS JR.

Fullerton, CA

Dear Mr. Schmidt:

I was reading, with great interest, Margaret Silbar's "Gluons and Glueballs" (Mid-September 1982), when I came across the assertion that "red, green, and blue" are "primary" colors.

At this point I stopped reading. Any first-year student of art can tell you that green is *not* a primary color. Consequently, I could place no credence in Ms. Silbar's other assertions and refused to take into my memory banks anything else she had to say.

S.C. ATTURA

Arlington, VA

Please go back and finish the article. What a first-year student of anything can tell you is often an oversimplification; this is a case in point. The choice of "primary" colors, in either pigments or light, is pretty arbitrary; there are lots of possible sets you can choose which can be mixed to produce a full range of colors. In fact, if you look at Edwin Land's pioneering research on color vision, you'll find that some of the possibilities are downright astounding!

Dear Mr. Schmidt:

If I understand relativity correctly, Don Sakers's "Escape Velocity" in the October *Analog* rests on a fundamental error. As an object's velocity increases, its mass increases, that is true—but *only in the frame of reference in which it is moving*.

An object's mass in its *own* frame of reference is always its rest mass. The same applies to the contraction of an object; a spaceship traveling at a speed close to that of light (in Earth's frame of reference) would appear pancake-shaped from our standpoint, but would still be its full six hundred meters in length to its passengers and to all objects moving with it.

It's true that the spaceship would present a large mass to any object it

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passed (and since gravitational attraction is involved here, the question is probably further complicated by general relativity), but the spaceship still couldn't act as a "black hole" to such an object. If the object was attracted to the spaceship, the observed mass of the spaceship would decrease as the velocities of the two objects became more nearly equal; if the attracted object could catch up with the spaceship, it would experience only the gravitational attraction of the spaceship's rest mass (since both objects would have the same velocity).

I'm surprised you let such an error slip by. Or am I missing the joke? Is the computer Kidenas just kiddin' us?

GARY MCGATH

Milford, NH

That's exactly the point of a "Probability Zero," and Don's is probably the closest to the original conception as any we've done recently! As the collective title implies, a classic "Probability Zero" should be a story which sounds *plausible but isn't because of some fundamental error in its premise — preferably one which is not immediately obvious to most readers.*

Dear Sir:

As a long-time reader of your publication (I started long before John W. Campbell was editor), the relationship between the technology presented in your magazine and its appearance as a realized fact has been of interest to me. Usually there is a period of months or years between the one and the other. However, in the September *Analog* there is a story by Gary McDonald titled "The Unfood," that reached me on Thursday, July 15. On Friday, July 16, I read the enclosed clipping and burst out in roars of laughter. Reality had caught up with fiction in 24 hours!!

Thank you for affording me such a pleasant concatenation.

PAUL ISHMAEL

Fremont, CA

The clipping, in case you haven't yet seen it somewhere, concerns sucrose polyester, a "fat substitute" resembling cooking oil but not absorbed by the body, recently developed at Procter & Gamble and tested at the University of Cincinnati. Science fiction writers have a real struggle to keep ahead of reality! ■

(Continued from page 131)

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a calendar of analog upcoming events

15-16 April
MUNCHCON III (West Virginia SF conference) at Marshall University, Huntington, W.V. Free admission. Guest of Honor — Nancy Springer. Films, art show, hucksters, games tourney. Info: Marshall University Science Fiction Society, Memorial Student Center, Marshall University, Huntington WV 25701 (include S.A.S.E.).

22-24 April
PENDULUM (SF/Doctor Who conference) at Holiday Inn, Ottawa Centre, Ontario. Guests—C.J. Cherryh, Lynn Abbey, Robert Asprin, etc. Video, gaming, costuming, etc. Registration—$13 until 16 April 1983, $15 at door. Info: Pendulum, Box 4097, Station C, Ottawa, Ontario K1Y 4P3, Canada.

22-24 April
Con*Tretemps (Nebraska-area SF conference) at New Tower Inn, Omaha, Neb. Guest of Honor—Gordon R. Dickson; Fan Guest of Honor—Gay Haldeman; TM—Rusty Hevelin; Special Guest—Joe Haldeman. Games, video, panels, dealers, etc. Info: Contretemps, Box 12437, Omaha NE 68112 (include S.A.S.E.). Supported by the Nebraska Arts Council.

23 April
HUMANICON I (New Hampshire SF conference) at the Salem Inn, Salem, N.H. Guest of Honor—Frederik Pohl. Info: Carol Morrison, 20A Gordon Dr., Londonderry NH 03053.

24-27 April
1983 Popular Culture Association National Meeting at Wichita, Kan. The Science Fiction/Fantasy Area will hold an academic meeting. Info: Thomas J. Remington, SF/F Area Chair, 1983 P.C.A. National Meeting, English Department, University of Northern Iowa, Cedar Falls IA 50614.

30 April-1 May
Creation Chicago (SF film, Star Trek, Dr. Who and Comic Book convention) at Hyatt Regency Hotel. 11 AM to 7 PM daily. Tickets $8 per day at the door.

13-15 May
MARCON XVIII (Ohio regional SF conference) at the Quality Inn Columbus, Columbus, Ohio. Guest of Honor—James P. Hogan; Fan Guest of Honor—George Laskowski. Hucksters, art show, films, gaming. Registration—$12.50 until 15 April, $15 at the door. Info: Marcon XVIII, Box 2583, Columbus OH 43216.

13-15 May
EUCON 1 (Oregon SF conference) at the Eugene Hilton, Eugene, Ore. Guest of Honor—Spider Robinson; TM—Dean Ing. Registration—$13 until 30 April, $15 thereafter. Info: Eucon, Box 1804, Eugene OR 97440.

1-5 September
CONSTELLATION (41st World Science Fiction Convention) at Baltimore Convention Center, Baltimore, Md. Guest of Honor—John Brunner; Fan Guest of Honor—Dave Kyle; TM—Jack Chalker. Registration—$15 supporting at all times. Attending—$40 until 1 July 1983, more at the door. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo Awards and the John W. Campbell Award for Best New Writer. Info: ConStellation, 41st World Science Fiction Convention, Box 1046, Baltimore MD 21203.

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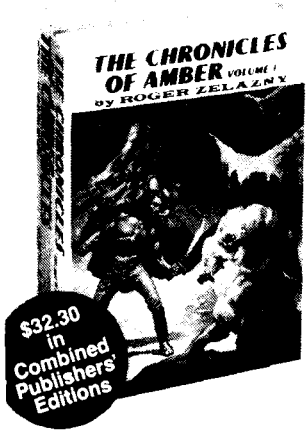

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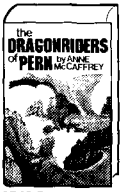

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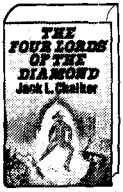

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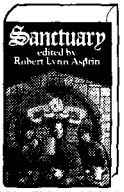

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